

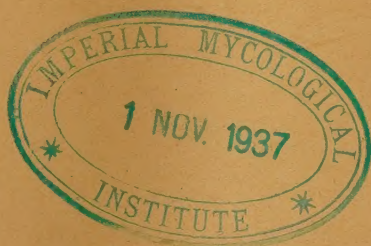


TANGANYIKA TERRITORY

DEPARTMENT OF AGRICULTURE

Annual Report

1936



1937

DAR ES SALAAM

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Annual reports of the Coffee, Sisal and other experimental stations have been published separately as pamphlets and are obtainable either from the Director of Agriculture, Morogoro, or from the Government Printer, Dar es Salaam

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DEPARTMENT OF AGRICULTURE

ANNUAL REPORT 1936

SECTION I.—GENERAL REVIEW OF THE YEAR.

Almost throughout the territory a good rainy season was experienced and the production of food crops was more than adequate. In some parts rainfall was excessive and this mainly affected the yield of cotton, but in low-lying areas flooding generally did some damage. As a consequence of the abundant rains, underground water supplies have been replenished and springs and streams flow more strongly.

The year 1936 represents the fifth year of the five-year period commencing in actuality and almost in general with the 1932 season, during which period the territory deliberately set about the business of increasing its saleable surplus of agricultural products, both edible and inedible. The tonnage again shows an increase over 1935 and we can now take stock of the position and see whether we have failed in our object. The endeavour has been only partially successful: a total of, say, 160,000 tons of principal agricultural commodities has been exported and, despite a better than average season, the territory has not reached the tonnage of exportable material which was then considered as necessary to revivify trade, increase income and raise railway receipts to a proper level. It may possibly take another three years to reach what we all hoped five years ago might be our export in 1936, namely, over 180,000 tons of agricultural produce surplus to internal needs.

I would examine what has been the real effort made. Of the 160,000 tons of exports some 90,000 is the production of estates, that is, of native workers under non-native direction. This leaves some 70,000 tons of export surplus as the purely native contribution, namely, double the 1931 native output. The population of the territory is over five million souls. If we set aside two million odd as workers on estates, railway and mines, or people who live too far from rail and port to be able to supply the export market except indirectly through supplying mines and other consuming enterprises, we find that some three million people are producing the 70,000 tons surplus, or just over fifty pounds weight per head—a little over two hundredweights per family of five. This figure is so low that it should be regarded as merely an indication that real production is possible. Ten hundredweights per family, i.e. 300,000 tons surplus from the three million people or 600,000 families, is surely not too much to expect in due course; this would involve the cultivation of an additional two to three acres of land per family.

After the above analysis it is heartening to turn to some individual crops, and wholly satisfactory to regard the f.o.b. prices which are today being paid for our surplus. We did not anticipate such a phenomenal rise in prices : we expected a slower recovery on that side and we prepared to have a volume of material for sale so that we would always be in a position to reap any advantage which might arise in the market. Prices, however, may fall and there is no control here over the market, but we can influence volume and thus are in a position partially to counteract any reasonable fall in price levels which would affect the total value of our outward trade.

It will be noted that in the report for 1932 the average value per ton of our principal agricultural exports was worked out for the three years 1930, 1931 and 1932. They were : 1930, £23 8s. per ton f.o.b. ; 1931, £14 16s. ; 1932, £15 18s ; and for 1936 we are able to report a recovery in value to the extent of putting us back to slightly above 1930 average values. The preferences enjoyed by our products in Empire markets since 1933 have undoubtedly assisted in this price recovery.

Record export tonnages of cotton lint, groundnuts, rice and ghee are to be noted as the outstanding features of export in 1936, whilst sisal, although two thousand tons lower than the record, is holding its production remarkably well, as is sesame with an export only a few tons below the record. Normally a recovery in prices encourages greater production and, therefore, we ought to expect considerable increases in 1937. Unfortunately weather conditions, and the ease with which native cultivators reach satisfaction, are likely to have a restrictive influence although, on balance, a general increase in surplus is to be anticipated.

Today it is a fact that the traders of this territory are not taking full advantage of the opportunity offered them to introduce more varied goods of higher quality. In many places we are still on the "wire and beads" standard, and "wants" are not being induced as one had hoped. There are signs of enterprise but they are mainly tentative and far too few have a permanent basis.

It would be a pity were the working native family forced to invest its surplus cash in the only bank it thinks it understands, namely, livestock, when it is all to the advantage of the trader, the territory and the people in it to keep money circulating and consumption increasing.

NON-NATIVE DEVELOPMENT.

There are indications that non-native planters are venturing and are preparing to develop more land. There is a small but steady development in tea planting and an increase in the area under sugar cane ; coffee continues to be planted though only on a small scale ; new areas are being opened up for sisal, and planters are producing a varied assortment of new and old crops on a small scale, including cotton, pyrethrum, lemon-grass oil, kapok, wheat, maize, tung oil, butter and vegetables. Enquiries regarding new crops are more frequently made, which shows that enterprise is reasserting itself and that sums of money are becoming available for development.

Two important amalgamations of sisal estates were effected in 1936, but in the main the industry is individually controlled, or is a small company venture.

Coffee planters are inclined to co-operate more and more but the industry cannot yet be said to be in a flourishing condition.

Tea planters have formed an association linked with the African Tea Planters' Association.

The sisal and coffee industries have their territory-wide associations and their very valuable boards, which latter advise Government on all matters relating to these industries and especially the uses to which the sums derived from export cesses shall be put.

I would here with all sympathy remark, as did my predecessor, that far too many non-native planters are speculators in land cultivation. Speculation is responsible for far too many bad coffee estates, for ill-tended and worthless cotton fields, for waste of valuable labour, for the prevalence of pests, and for unchecked soil erosion. So many men are farming who have but a hazy knowledge of the art of agriculture that too large a proportion of non-native farming endeavour is essentially poor.

Furthermore, poverty in knowledge and aptitude is allied to lack of money and it is more than doubtful whether a number of non-native planters will ever advance their practice and become stable settled agriculturists. By the above I do not wish it to be inferred that non-native agriculture is everywhere of a low standard. There are very many instances of excellent management and practice, but the pity is that these good people have at times to farm alongside the careless, inept and improvident land-holder, multiplying risks and checking advance.

NATIVE DEVELOPMENT.

It is interesting to observe the progress which sections of the native population are making in this territory; equally is it distressing to find native communities which invariably fail to react to advice. Some native communities are prepared to live in sloth, are unwilling to take the most elementary precautions to conserve their land, disregard all warnings about bush firing on hillsides and generally avoid making any particular effort to better themselves or their agriculture.

When thinking of native development and native production the conception must be a family unit. People are prone to compare the native labourer with the native cultivator. For all practical purposes the two are distinct. A native family often can and does cultivate a reasonable acreage: rarely are all of the members of the family incapacitated at the same time and thus the holding receives attention, even though the peasant himself is debilitated. It follows that instruction and advice should be given to the family and it is wrong to direct attention to the adult male alone. Careful observations and records have been made of peasant holdings and we find that it is not difficult for a family, using hand implements alone, to cultivate six acres of land which is ample to provide food and cash for the family for a year.

The introduction of two oxen and a simple plough enables the family to cultivate up to ten acres. As cleaning and harvesting are carried out entirely by hand it is impossible for a family, unless it is a very big one, to look after more than ten acres of cultivated land in a season and it is quite inadvisable to expect more at present. We are a very long way even from six acres of cultivated land per family, but the above will show, I think, that the native families in this territory can go very very much further than they have done even by using hand implements alone.

As examples of progress in reactive and perhaps better favoured communities I would refer to the gradual development of small-scale irrigation in native areas, the anti-erosion rules passed in many parts of the territory by the

people themselves and applied by them, the accelerated planting of trees, greater inclination to respect hillsides and hilltops and keep them in the natural condition, the occupation of new lands by surplus population, their anxiety to co-operate—which is rather too far ahead of purely native ability when applied commercially—and generally, with gradually increasing numbers of people, a growing sense of self-reliance and greater interest in the land.

It is all important that we make no serious mistake in our agricultural policy today, because it would be a great pity were we to misuse the opportunity which these days provide. There is so very much to do, and so many people are anxious to see advances in this and that direction, that I hope we shall not be misled and fail to see the wood for the trees. Simplicity ought to be the keynote of all our endeavours with native and also plantation agricultural industries. Today in this office one test of the soundness of a proposition is generally the answer to the question: "Is it naturally simple?"

LABOUR.

With the revival in plantation agriculture and the new development of mining, an increasing demand for labour is manifesting itself. Some time must elapse before the flow of labour is resumed after the check applied by the depression. Unfortunately, practically all our crops are labour crops, but it ought to be possible to devise methods which are more economical of labour. Equally also it ought to be possible to increase the output per working labourer per day. But these things are matters of slow development and they are usually associated with a higher wage rate and better conditions of employment. We cannot expect to rectify everything in a year or two but we can, I think, look ahead and approach each part of the problem gradually and sanely. Whilst our immediate needs are pressing it is important that the supply of labour be accelerated, but it rests with the industries to see to it that relations with labour are progressive, so that a natural and sufficient flow or supply is induced for the future.

It has been said that increased native production both of food and of export crops has affected labour supplies, but it is not suggested or accepted that native agricultural production should be discountenanced or be left unguided in order that labour supplies may possibly be augmented.

IRRIGATION AND NATURAL WATER SUPPLIES.

A steady development of small irrigation systems has to be recorded and these small projects are laid out by natives, generally under guidance. There is scope for larger and more permanent development, and the provision of technical assistance is awaited.

The construction of catch dams has received impetus. There is usually some anti-erosion value in a dam properly sited with the spill-way lined out and baffled at the discharge end. It would be most helpful in the occupation of fly country were we able to construct dams in advance of, or simultaneously with, new occupation.

Government is very much alive to the needs and possibilities and the situation is receiving close and careful study.

SOIL EROSION.

This subject will be exhaustively dealt with in a separate paper to be presented to Legislative Council. In every area in which there is an agricultural officer demonstrations of methods have been laid down, some on scale. Sound

soil practice is usually required where new crops are introduced or with permanent crops under expansion. Thus onions, when the crop was expanded on Kilimanjaro, were deliberately recommended to be grown on terraces. All wheat in the hills to the north of Kilosa-Morogoro, a recently introduced crop, is grown in contour strips. Native coffee in Songea, Tukuyu, Mbosi, Bugufi and Kilimanjaro is planted in approved fashion on approved sites and the deliberate planting of crops in line on the contour is in evidence. Thus cultivation rules afford us the opportunity of spreading demonstrations of good practice throughout an area and then pointing the moral generally.

A number of native authorities have adopted and are enforcing rules to deal with soil erosion and the protection of trees and herbage on river banks. They are quite simple rules and are the outcome of some years of demonstrating and preaching.

Except for tea planters in general and a few coffee planters, soil conservation methods are not usually practised by non-native cultivators, and in some native areas, particularly the Eastern province, there is practically no natural or induced practice tending to prevent soil wash. There is a growing tendency to protect hilltops and hillsides and retire cultivation to more gently sloping land. Contour *matuta* (planting ridges), lines of pigeon-pea and *manyara* on contour, and contour windbreaks are all beginning slowly to come into practice, but we have a long way to go.

Irrigation, drainage and the development of water supplies require study in connection with erosion problems.

MARKETING.

There is little to add to the report made under marketing on page ten of the 1935 report. We are satisfied that markets for native produce must be constructed in such a way as to permit of the inspection of the produce entering the market, permit the owner to weigh his parcel of produce, and admit of the transaction of purchase taking place in the light of day. We also feel that the throwing open of markets to all and sundry buyers is perhaps inadvisable, and that those shopkeepers who trade in minor settlements near the market should be encouraged to take their place in the market. This latter remark does not necessarily refer to the purchase of cotton, for which special provision is required. Produce markets have not been instituted merely for the protection of growers; they operate equally to protect the buyers, who are credited usually with the ability to protect themselves. We wish to see buyers purchasing sound quality produce, not being forced in self-defence to buy poor, damp material, on which they invariably lose money owing to subsequent deterioration.

I believe that properly constituted produce marketing will be welcomed both by buyers and sellers and remove from the sale of produce, doubts, uncertainties and anxieties in regard to that produce.

Without difficulty or hitch, the *compulsory grading* of all coffee leaving Bukoba was introduced during the year. The introduction of the grading system, first under compulsory inspection and finally with compulsory grading, is an example of the careful and educative manner in which innovations have to be introduced in this territory. Time was given for the trade and the people to adjust themselves and we have pursued the same methods in introducing the new marketing system.

The marketing of maize grown in the Northern province is still in a state of evolution. The kindly offices of Colonel Griffiths, c.m.g., of the Kenya Farmers' Association, have been taken advantage of, but growers, especially planter growers of all races, must not look on a mutual marketing organization as one only to be used when it is apparently advantageous to do so. Support must be consistently given. No doubt with patience and a few burnt fingers the problem will resolve itself.

PESTS AND DISEASES.

Pests.—The year under review has been a fortunate one in its comparative freedom from serious pest outbreaks. Locusts caused some anxiety in view of the continued infestation of countries to the south, and there was a short period during August when migrant swarms of the red locust came over our southern border. Fortunately this attack did not develop. Breeding within the territory was confined to the Lake Rukwa area and to the districts on the southern and western shores of Lake Victoria, and little damage was done. Later in the year there were a few incursions by small swarms over our north-western border, but without damage to crops. Locusts are still prevalent in Africa and are menacing to the territory. The amount expended on active anti-locust measures in 1936 was £45 and in view of the permanence of the threat a vote of £500 is included annually in the territorial estimates. Research work on locusts is supported by government funds through the International Locust Research Scheme.

Plantation crops have been little troubled by pests. Sisal weevil has reverted to its original status as a minor pest. Tea has been without serious pests. Coffee continues to improve except in the cases of *stephanodores* in Bukoba and *anthores stemborer* in the remainder of the territory. Field sanitation is the backbone of pest control, particularly with plantation crops.

Cotton and native crops generally have suffered in many parts from the length of the rains. Water-logging, late planting and cloudy weather encouraged pest incidence in localized areas, with the result that in the eastern part of the territory cotton suffered from helopeltis bug and American bollworm.

Vermin continue to levy their toll and the organized poisoning of baboon and pig continues in many districts. The prompt use of barium carbonate bait in the Kilosa district warded off an outbreak of field mice.

The report of the Entomologist is given in Annexure IV.

Diseases.—The incidence of plant diseases has been normal during the year. Sisal wilt was apparent in a number of plantations during the dry season. A root disease of tea, suspected to be due to *Fomes lamaoensis* has appeared in the Mufindi district.

Grain crops show improvement in areas where seed treatment to control smuts is practised.

Mr A. H. Ritchie.—By the untimely decease of Mr A. H. Ritchie in February 1936, the department has lost an entomologist of conspicuous ability. Coming to the department in its early days, in 1921, after serving in Jamaica, Mr Ritchie was the only official entomologist in the territory for a number of years and his activities covered a wide field. In recent years he specialized in the pests of coffee and it is for his work on this crop that he will long be remembered. His knowledge of all branches of coffee cultivation and his

essentially practical outlook were greatly appreciated by the planting community. His development of the arsenite of soda spray for antestia control, and his work on the white borer are but two of the many contributions he made to coffee pest control.

EXPORT CROP ESTIMATES.

The table below shows the comparison between the estimates of export published on the 1st April 1936 and the actual export of the chief products for the year :—

Estimate issued on 1st April 1936; Crops surplus for export			Sisal Tons	Coffee Tons	Cotton lint Tons	Groundnuts Tons	Beeswax Tons
Actual export for 1936			80,950 ...	13,336 ...	12,484 ...	19,555 ...	303
			80,559 ...	12,146 ...	11,274 ...	22,786 ...	524

Details of the amounts of exports of the chief export crops are given in the following table :—

PRODUCT		1933		1934		1935		1936	
		Maximum Output for Export prior to 1936	Value per ton f.o.b.	Amount	Value per ton f.o.b.	Amount	Total Value	Amount	Total Value
	Year	Tons	£ s.	Tons	£ s.	Tons	£	Tons	£
Sisal	1935	82,676	12 13	72,510	11 14	82,676	1,134,732	80,559	1,873,312
„ (manufactured)	1935	2,048	—	754	24 10	2,048	52,074	*2,325	75,942
Cotton Lint... ..	1935	9,980	54 11	5,645	57 17	9,980	569,547	*11,274	640,625
Coffee	1935	18,588	33 15	14,766	33 11	18,588	486,842	12,146	342,090
Groundnuts... ..	1933	19,177	8 13	8,036	7 10	16,429	210,018	*22,786	277,226
Hides and Skins... ..	1933	4,140	39 11	3,459	38 17	3,131	153,132	†3,094	207,549
Copra	1928	9,318	8,157	5,730	5 14	4,050	38,247	7,458	82,246
Sesame... ..	1932	4,811	4,441	3,740	8 7	4,127	43,606	10 11	56,738
Rice	1933	6,293	6,293	6,259	12 5	4,924	66,917	*6,513	73,508
Millet and Mtama	1928	7,732	2,845	2,735	4 9	3,597	15,273	3,539	14,636
Maize	1934	2,901	868	2,901	3 11	1,434	3,580	2 10	3,346
Beeswax	1933	680	680	407	80 7	531	46,260	524	52,040
Gums (Copal and Arabic)... ..	1934	1,124	1,015	1,124	19 12	848	17,375	475	13,223
Ghee	1913	662	480	662	40 13	607	24,477	*713	34,144
Total		170,130	135,489	128,728	16 10½	152,970	2,862,080	157,519	3,747,525
			16 2						23 16

*New high record export tonnage. †Tonnage of skins not ascertainable.

NOTES ON CHIEF EXPORT CROPS.

Sisal.—The export of this staple commodity, which is responsible for half of the tonnage of agricultural exports from Tanganyika annually, fell slightly in 1936 as compared with 1935. The f.o.b. price per ton for the various grades rose gradually throughout the year and the statistical position of sisal stocks remained very sound. It is anticipated that slightly higher prices will prevail during 1937; consumption is spreading, and as new uses for this product are found or its substitution for more expensive fibres becomes more general, prices may rise so far as to check these developments.

Planters in the territory are not only apprehensive of the maintenance of their production, but a growing sense of the inadequacy of their cultural operations is becoming manifest. In two directions they are becoming concerned, one as regards maintenance of the soil and the crop derived therefrom, the other as regards the organization of the field management of the estate. Excellent as are the engineering arrangements and organization of many of the factories and the transport systems used, there is perhaps a lack of application of advancing practice to the field.

It is perhaps pertinent to examine what a great, practically dominant, part is played by labour under the prevailing system of field management, and what the annual out-turn per labourer is worth. It is computed that today the industry needs an enrolment of at least eighty thousand labourers in order to maintain production, and to develop for gradual expansion. Possibly not more than an average of sixty thousand labourers work daily, thus one labourer working for three hundred days a year is required for the production of approximately one and one-third tons of fibre, value, say, £32 f.o.b. Having regard to the cost of oil, fuel, engineers, spares, materials, transport, depreciation, management and finance which must represent a great part of the £32, I opine that the production of fibre per head of labour is too low, and it may indicate the low intensity of the effort the worker is making, lack of balance in the system under which sisal is grown and recovered, a too low price for sisal, or some other things, or all of these together.

This industry today is very much dependent on goodwill; it requires support at least from the labour aspect whilst it reorganizes in the direction of labour economy. On its past record and with a knowledge of the calibre of those engaged in directing its fortunes, I am sure it will overcome its present difficulties, provided it is given time for the process of essential adjustment.

The industry is alive to its responsibilities; it supports research both here and overseas, it co-operates with the industry in Kenya, and it is a pleasure to deal with its representatives, a reasonable and live body of men, both in the Association and on the Sisal Board.

The general report of the Director of Research on Sisal Overseas, published by the Board of Trustees for sisal research, was issued at the end of 1936 and the annual report of the local Mlingano Sisal Research Station has also been published and is available.

The following are the figures showing production in the various areas for the past three years:—

	1934 Tons		1935 Tons		1936 Tons
Northern and Tanga Provinces ...	45,501	...	49,374	...	49,092
Eastern Province	18,650	...	22,613	...	22,702
Southern Province	8,359	...	10,689	...	8,765
Totals ...	72,510	...	82,676	...	80,559

Coffee.—The production of this commodity fell heavily from 18,588 tons in 1935 to 12,146 tons in 1936. This was due chiefly to poor setting of fruit in Bukoba where production fell by 4,417 tons on the year.

Natives in various coffee areas are steadily increasing their planting, except possibly in Bukoba. In all other coffee districts new plantings are made on approved sites, using good plants and an anti-erosion layout. Every effort is made to see that mistakes in planting are avoided, and that the young coffee is given the best possible chance to establish itself.

Recording of production of individual trees reveals that a large proportion of arabica trees in bearing are almost consistently shy bearers, and the need for the exclusive use of seed from consistently high producing trees is becoming manifest. Further work, however, is needed before the department is able to recommend approved strains. The report of the Coffee Research Station at Lyamungu has been published separately.

In Bukoba cultural work with coffee shows little advance; efforts to arouse greater interest in the care of plantations by native owners are made continually, but it is perhaps idle to hope for any significant change. Advice and demonstration may fail to achieve results with these self-satisfied people, but it would be unwise to use coercive measures until some section of public opinion in favour of better cultural systems is manifest. With that to back the work, waverers can be influenced and the totally unresponsive be brought to a sense of reality.

During the year those engaged in the coffee industry in each of the territories of East Africa were brought together and an organization for closer co-operation was established, namely, the Inter-territorial Coffee Producers' Committee, representing the three coffee boards of Uganda, Kenya and Tanganyika.

The figures for production in the main coffee areas in the past three years are :—

Area				1934 Tons		1935 Tons		1936 Tons
Bukoba	...	...	...	10,210	...	10,882	...	6,504
Northern and Tanga Provinces	...	...	...	4,379	...	7,234	...	5,174
Southern Highlands and other areas	...	...	...	177	...	472	...	458
Totals				14,766	...	18,588	...	12,136

The following are the export figures of native and non-native, or estate-grown coffee :—

				1934 Tons		1935 Tons		1936 Tons
Native	...	...	...	11,834	...	12,944	...	8,704
Non-Native	...	...	...	2,932	...	5,644	...	3,442
Totals				14,766	...	18,588	...	12,146

The following are the particulars of coffee inspected and graded at Bukoba during the year 1936 :—

Number of Bags of 200 pounds.

			GRADED			REJECTED	TOTAL EXPORTED
			G.A.Q.	F.A.Q.	Triage		
Arabica	...	...	2,842	23,144	—	3,464	25,986
Robusta	...	...	375	46,956	440	11,831	47,771
TOTAL							73,757

Rejected coffee is taken back into Bukoba and again cleaned so that a considerable proportion of rejected coffee is eventually exported. The table shows that on the first submission a very large proportion is fit for a grade, i.e. about seventy-five per cent.

Cotton.—During the year some progress was made towards a decision regarding produce marketing, including cotton, in the Lake province. As regards cotton it is only an interim arrangement and during the next ten years the system should be closely watched in order that it may be perfected. The ginner is interested in the big crop and in the maintenance of quality; the middleman is interested largely in what he terms his “right” to buy seed-cotton, which he can exercise by operating in the market, or can sell to someone without a right who wishes to buy.

Judging by the anxiety with which these “rights” are sought after or demanded, it can only be deduced that it is an advantageous possession, requiring but small capital. One can only stigmatize as foolish and uneconomical any method of marketing which permits such an excess of buyers as is deemed necessary by certain interested parties. These parties are anxious to establish the position that an inordinate number of buyers should be given the opportunity of buying a tonnage of crop which it is more than within the ability of one buyer to deal with. In effect their desire is that the commission and other accretions from the market shall be divided up amongst a number of people. Clearly no economies are possible in these circumstances but rather greater expenses.

The officers supplied by the British Cotton Growing Association, who function as ginnery and market inspectors, have rendered excellent service and we are now in a position to see that ginneries and ginning is improved. In this the majority of ginners are with the department. It is refreshing to receive, from those ginners who were sceptical, communications which go to show that the services these two officers render are very much appreciated.

The finance supplied by the Empire Cotton Growing Corporation has been of value to the industry and to the department during years of depression when money for experimental work was hard to come by. The industry must anticipate assuming responsibility for these services when the period of the grant expires on the 31st May 1939. It is hoped that by then the production of cotton will have risen to such proportions that a very small increase in the cotton cess will suffice.

Native production of cotton has increased in the Lake, Northern and Tanga provinces, and in the Rufiji and Bagamoyo districts of the Eastern province. The introduction of cotton into the Tabora district is a distinct failure, but there is promise of increase in the new areas of Singida, Bukoba and Tunduru. The Southern province was again disappointing, but there are signs of development.

Estate-grown cotton shows an increase in the Kilosa district and in the Northern and Tanga provinces. Some sisal planters are again using cotton as a catch crop in newly planted sisal land, and in view of the rise in price of lint they should further extend this practice.

In 1936, 63,130 bales of cotton of 400 pounds were exported—another record. The carry over from 1936 to 1937 is known to be greater than the carry over from 1935 to 1936. I can see no signs of retrogression in general, but the stagnant condition of production in the Kilosa and Morogoro districts

is noteworthy and, in the opinion of the department, is due to conditions which could be changed.

PROVINCE	SEASON'S PRODUCTION OF LINT IN CENTALS				Seed-cotton in Centals 1936
	1933	1934	1935	1936	
Lake and Western	60,358·0	106,501·1	158,820·7	169,579·3	547,030·0
Eastern	56,452·7	43,397·0	59,221·9	57,858·4	186,640·0
Tanga & Northern	2,616·2	3,334·0	13,155·5	23,085·7	74,470·0
Southern... ..	3,911·2	2,804·0	2,995·2	3,182·3	10,265·4
Total ...	123,338·1	156,036·1	234,193·3	253,705·7	818,405·4

Non-native production for 1936 is estimated at 6,200 bales of 400 pounds each, that is about ten per cent of the total production.

The sale of seed-cotton by natives during the 1936 season is estimated to have returned to the growers Shs. 8,110,700 or £405,500.

Groundnuts.—An edible crop of high nutritive value. I wish to emphasize that some, if not the majority, of our native-grown export crops are edible, and they are of such a nature as to justify increased and more widespread production; of these the chief one is the groundnut. It is a crop valuable agriculturally in rotation, is a grand alternate to grains and cotton, and its culture should be encouraged almost throughout the territory. Planters might endeavour to grow a groundnut suitable for the American and Canadian markets, which require "peanuts" of quality and pay a quality price for them.

The main areas of production are the Lake and Western provinces; the Southern province is showing a steady increase as is the Central province and very small quantities are grown in the Tanga and Eastern provinces.

A record crop of 22,786 tons was exported in 1936 and sold at good prices, therefore an increase in planting may be anticipated. As it is practically the first cash crop of the season to be harvested and sold, it is important to see that the early offerings are dry enough for export. Central marketing enables the buyer to avoid the purchase of damp groundnuts, and the spread of marketing systems will obviate the losses which have been suffered in the past through uncontrolled too early selling at shops in townships.

Sesame.—Another valuable food and export crop, which is in steady production. An improvement in appearance has been achieved by seed selection. The crop should be encouraged wherever it will grow and not be permitted to die out as appeared to be likely six or seven years ago. Export of 1936 reached 4,745 tons, a few tons below the record of 4,811 tons of 1932.

Copra.—There has been a steady increase in production for export which has coincided with the increased price of this commodity. Furthermore, the palms are looking greener than they have done for some years. The contrast between the colour of the palms in Zanzibar and on the mainland has been marked for years, and at last mainland palms appear to be on the way to recovering their vitality. This is also a food crop, but it is given scant care by its native owners; fires in small plantations occur at times and the disposal of dead palms, the breeding place of the coconut beetle, leaves much to be desired. By registration of ownership of palms and supervised marketing of *ripe nuts* only we may hope to stop thieving, and by centralized drying, using

kilns, we are able to raise the grade of native-grown copra. Except in well defined areas this work is hardly worth while economically. The work commenced in Mafia towards the end of the year may lead us to a solution of difficulties in connection with this product.

Grains.—Bumper crops of rice, maize, sorghums and millets were reaped in most areas. The rice exports reached the new high record of 6,513 tons as compared with 4,922 tons last year and the previous record of 6,293 tons in 1933. There is an increase in the production of maize by Europeans and natives in the Northern province, where many coffee planters who farm on the lower slopes of Kilimanjaro have turned to maize production. The Southern province which has always been noted for its large grain production exported over 3,000 tons of maize and large surplus stocks are still held by traders. The general improvement in the sisal and mining industries has increased the internal demand for grain crops, so that the exports from the territory are no real indication of the actual production.

The following are the export figures for the three main grain crops for the past four years :—

	1933		1934		1935		1936
	Tons		Tons		Tons		Tons
Rice	6,293	...	6,259	...	4,922	...	6,513
Sorghums and Millets	2,845	...	2,735	...	3,597	...	3,358 $\frac{3}{4}$
Maize	868	...	2,901	...	1,434	...	1,368 $\frac{1}{2}$
Totals ...	10,006	...	11,895	...	9,953	...	11,420 $\frac{1}{4}$

Tobacco.—Plantation tobacco production shows no particular advance but there is a slightly increased production in the Songea district. Native production of fire-cured tobacco is increasing in the Songea and Biharamulo districts, in which areas the department and the administration are giving attention to the crop.

The total production for the year was over 240 tons of baled leaf ; very little of this was exported to Europe, but 100 tons of Songea leaf was sent to Uganda for the purpose of blending with tobacco grown there. It is likely that a permanent trade with Uganda tobacco manufacturers will be built up.

Tea.—Tea planting progresses slowly and new areas, 837 acres in extent, were planted up to April 1936. Production of leaf is increasing steadily, but it is still on a very small scale and the greater proportion of made tea is consumed locally.

The Tea Growers' Association appears to be dominated by the factory interest. In the absence of a person or persons capable of representing the individual grower, his interest will have to be safeguarded by the department. The amount of new planting under restriction is showing a shortfall on the proportion which it was expected would have been planted by the end of 1936.

OTHER CROPS AND PRODUCTS.

Beeswax.—No insuperable difficulties have been met with in the control of the condition in which this product should be exported. Prices have risen steadily through the year, but at the same time quality has been maintained. It is in times of rising prices that adulteration is practised almost with impunity, and when the market is falling malpractices come to light. The regulations as applied should discourage adulteration and maintain reputation.

A total of 524 tons was exported in 1936, which is quite a good output having regard to the general prosperity of the agriculturist.

Kapok.—A small crop gradually increasing in value. Seed of kapok has a high oil content and now should justify export.

Citrus.—The development of this crop is likely to be mainly on account of its dietetic value and, judging by the numbers of young citrus trees which are being planted in various parts of the territory, in a few years fruit or juice should be available in most areas of the territory.

Cinchona.—Nurseries for the types *ledgeriana* and *succirubra* hybrid have been prepared in the Mufindi, Tukuyu, Ufipa, Bukoba, Kilimanjaro, Lushoto and Morogoro areas. Comparatively large areas are suitable to the crop, which could be much more extensively developed.

Kweme Nut (*Telfairia pedata*).—After many years it would appear that the commercial possibilities of this crop have been recognized and a deliberate attempt to produce nuts for export is being made. The kernel of the nut is of high value and in demand in the confectionery business overseas. Natural conditions for the growth of *Telfairia* occur in the western Usambaras, and doubtless there are several other areas where the plant will grow. Native people have used this edible nut for many years.

Oil Palm (*Elaeis guineensis*).—An old plantation of the West Coast oil palm is to be found in the Tanga province and there are a number planted in the Kigoma district. It is apparently an uneconomic business to extract and export the oil, but there is a distinct possibility of its extending use locally in native dietary. Inquiry as to the possibility of spreading the growth of the palm in the Tanga province led to the conclusion that it was unlikely to become a sound crop for natives to grow.

Tung and associated Oil Trees.—The comparative success of tung (*Aleurites fordii*) in Kigoma has earlier been reported. *A. montana* thrives in the Uluguru where *Fordii* is a failure. *Triloba* seems to flourish over a greater range of country than either, but has little commercial value. Experiments in grafting *Fordii* on *Triloba* were made: the grafts took but after a year the scions blackened and decayed to the stock.

Fruit.—There is naturally a steady small planting of orchard fruits from which in time an industry may evolve.

Essential Oils.—A few planters have purchased small stills for the distillation of essential oils. The department is not equipped for the prosecution of a proper study of this sideline. Small quantities of petit-grain and lemon-grass have been marketed.

Insecticidal Plants.—*Pyrethrum* is being grown in the Northern and the Southern Highlands (Iringa) provinces, and when production justifies such a course it will be necessary to instal a press or presses for the product. It will not be possible for the department to guarantee the analysis of the product as is done in Kenya for it is not equipped to perform the service.

Derris elliptica.—The importation of *D. malaccensis* was prohibited during the year in order that the quality of the derris growing in the territory may not be adulterated by the introduction of possibly inferior material. In view of the demand for cuttings and plants, arrangements were made to multiply planting material on some scale. In addition a few planters are growing plants for sale to others. No bulk commercial sample of Tanganyika-grown derris has yet been submitted to the trade, and the soil, climatic and cultural requirements of the crop have not yet been properly determined. Planters are therefore

recommended not to assume that in derris we have a crop ready to take its place in the agriculture of the territory.

A horticultural survey is required in order that information regarding all kinds of lesser economic and fruit crops may be collected. It is thought that the creation of a special division to cover this important aspect of agricultural activity should be given careful consideration. There is great scope and nothing is gained by disregarding this important section. Experience goes to show that without specific attention valuable sidelines are apt to be overlooked.

FOOD CROPS.

The commoner food crops utilized by people, especially native people, in this territory have long been known. Some of them figure, as they should, in the list of export crops, others have no particular commercial significance, and yet others are never bought and sold but merely collected for immediate consumption. There is no particular organization to deal with perishable or raw fresh foods and it is mainly in the seaport towns and towns on rail that fresh food, both imported and locally-grown, is available throughout the year.

In the country fresh fish is not readily come-by, but there is a trade in dried fish. Fresh meat is available when there is a kill or, in the country towns, Bukoba and the Northern and Tanga provinces, by the organized delivery of stock on the hoof to various killing centres. The occurrence of "fly" has an effect on the distribution of livestock for consumption.

The food supplies of the main mass of the native population, and especially the livestock-owning population, incline to be seasonal in point of time and very often in volume. The use of storage and its efficiency has an effect on the availability of grains and pulses, and the fact that food grinding and food preparation are arduous influences the types of food which are utilized. Furthermore, what ought to be the dominant factor in the type and volume of food supply remains, namely, the soil and the altitude at which it lies. Beyond this, however, the energy, foresight and inclinations of the cultivator who often thinks in terms of hardship and shortage and works in terms of abundance, ever relying on good fortune or charity, are the real dominant factors.

It is not an easy matter to present a picture of the food crops grown and the food which is available to people in the territory, but a close survey shows what a great variety of food can be produced. Perhaps it will be best to give a list and indicate flow and distribution. Broadly, the territory may be divided into three classes of country: (a) highland near rain forest, (b) intermediate *brachystegia-miombo* plateau or savannah land, 1,000 to 4,500 feet, and (c) tropical lowland including river valleys and coastal land.

The food crops may be subdivided into: (i) major food crops utilizable or available throughout the year, (ii) major food crops consumed but not stored, (iii) minor food crops, including those gathered wild, and fruit and (iv) food and food crops purchased or bartered.

In the highland areas there is a great variety of food and usually an abundance of it. These areas are food-producing areas and practically the only cash crop grown is coffee. Large quantities of food are taken down the slopes to people who live in country which falls under category (b). As a matter of fact the main energy of the population is expended in areas falling under category (b) and highland and coastal natives, together with stock-owning

tribes, do much business directly or indirectly with the people who live and work in this middle country. It is clear that, by exchange and the development of communications, food supplies in greater variety can be and have been made available practically throughout the year. The people who live in hot river bottoms can by irrigation produce fresh food in the dry season, and by organization and development the food situation both in variety and volume is soluble.

1.—*Major food crops* utilizable and available throughout the year.

(a) *Highland*.—Maize, peas, sweet-potatoes, cassava, beans, eleusine, dried bananas.

(b) *Savannah, brachystegia-miombo plateau midland and lowland bush*.—Maize, sorghum, millets, beans, sweet-potatoes, cassava, groundnuts.

(c) *River bottoms and coastal lands*.—Maize, sorghums, cassava, rice and millet.

2.—*Major food crops* eaten as produced and not stored.

(a) Maize eaten green or kept a few weeks, English potatoes, wheat, peas and bananas.

(b) Green maize, cassava and sweet-potato tops.

(c) Green maize and cassava tops.

3.—*Minor food crops* including fruit, nuts and food gathered in the bush.

(a) Coleus, seed of various grasses, *Telfairia* nut, onions, several wild fruits and Bambarra groundnuts.

(b) Coleus, grasses used as spinach, the fruit of an olive, sesame, pigeon-pea, lima beans, gram, cowpeas, yams, bananas, pumpkins and pumpkin leaves, pennisetum, citrus fruit, mango, pineapple, pawpaw, cape gooseberry and wild cardamoms. Vegetables like tomato, capsicums, okra, spinach, leaves and young shoots of many of the above plants.

(c) Coconut, sesame, cashew, pawpaw, mango, sugar-cane, bananas, pineapples and fish.

From some of the above, in addition to a number of wild specialities, fermented nutritive drink is made, as also from honey. Brewing is almost a general practice.

4.—*Food purchasable*.—Meat, sugar, dried fish, ghee, expressed oils and sardines in the tin. Flour cakes fried in oil.

The department is working on a number of the above food crops in order to improve yield and practice. For instance, rice and maize selection work, the separation of the various sorghums to isolate types of shorter growth period, the evolution of a bird-proof millet and millet varieties for use as catch crops, the breeding of a wilt-resisting cassava, isolation of high yielding strains of sweet-potato, the introduction of rust resistant wheat, the distribution of varieties of beans and cowpeas and pigeon-peas, are all receiving attention; as are the more general spread of the groundnut on which work has been done to isolate types; the improvement of the appearance of sesame; the issue of quantities of citrus, about ten thousand trees in 1936 alone, and other fruit trees in lesser quantities. The soya bean is under trial in three areas. Reference to the reports from the circles which are annexed will show that work on food crops is proceeding at all experimental stations and in many districts.

A major pressing problem is to increase the proportion of nitrogenous to starchy food which is produced and consumed by natives.

SECTION II.—DETAILS OF ASSISTANCE AND PROGRESS.

The organization of the department has been fully described in previous reports. The Director and Deputy Director are at headquarters, Morogoro, while the Senior Agricultural Officers are in charge of the circle organizations. Agricultural officers are posted primarily to the experimental stations and to areas most likely to benefit from their services. The field staff is reinforced by agricultural assistants and such temporary European staff, in the form of district foremen and cotton supervisors, as the exigencies of the situation require and funds permit. The Chief Scientific Officer, Chemist, Plant Pathologist, one Entomologist, an Agriculturist and a Horticulturist are stationed at the Coffee Research Station, Lyamungu, and the other Entomologist works at Morogoro. The two ginnery inspectors are stationed in the main cotton producing areas with their headquarters at Mwanza and Morogoro respectively. In addition to the above an African staff of agricultural instructors is maintained which in turn is supplemented by a local staff of instructors supported by the native authorities.

During the year particular attention has been given to the training of the African staff in order that they may get a better understanding of the pressing problems which beset the agriculturist and thus be better equipped to apply the preventive, corrective or ameliorative measures recommended by the department.

Among the many activities in the field specific heed has been paid to field sanitation to control pests and check disease and to the vital problems connected with soil erosion and the maintenance of soil fertility, while within the realm of agricultural economics much has been done to control native resettlement, to establish peasant farmers, and to organize and regulate the marketing of native produce.

The Sisal Experimental Station, Ngomeni, and the Coffee Research and Experimental Station, Lyamungu, working in close co-operation with Amani, are designed to assist the producers of the two main plantation crops—sisal and coffee—in solving the numerous problems which embarrass these industries, and to make them more productive. The Iheme Experimental Station, Iringa, deals with the local non-native and native farming problems in the northern part of the Southern Highlands while the experimental stations at Morogoro, Lubaga, Ukiriguru and Mpanganya encompass the diversity of problems encountered in native agriculture.

From these centres of progress the extension farms with their native settlement schemes, the seed and demonstration farms and peasant-holdings have evolved. The natives in many areas have quickly assessed the value of these institutions and the educational facilities they provide, and the fervid desire of the native to take advantage of them has moved us to establish small schools on some of these properties. This extension of educational activities has met a very definite demand and has the support of many chiefs.

From the above details it will readily be conceived that the department is able to exercise some influence on all phases of agriculture and it is hoped in the future to extend the work to the more remote parts of the territory. A brief review of the work carried out in the several circles and provinces is given below.

NORTH-WESTERN CIRCLE.

This circle comprises the Lake province, with its large native population concentrated round the shores of Victoria Nyanza, and the Western province which is, in area, the most extensive in the territory. The staff consists of a senior agricultural officer stationed at Mwanza with agricultural officers at Ukiriguru, Shinyanga, Bukoba, Biharamulo, Kigoma, Tabora and the Nyakato agricultural training centre (Bukoba). A senior agricultural assistant is in charge of the coffee grading work at Bukoba port, while either agricultural assistants or district foremen are posted at the experimental stations, Lubaga and Ukiriguru, the extension farms at Nyamahona, Itumbi and Mwanhala and to the districts of Maswa, Bukwimba, Bukoba and Bugufi. The ginnery inspector has his headquarters at Mwanza.

During the year under review the weather generally was favourable, although the rains were late and unduly prolonged. The Lake province beat its previous high record for cotton production and both provinces created new high records in groundnut and rice production. The Bukoba coffee crop showed a serious decline, and as the wealth of the Bukoba district is derived from its coffee crop both traders and growers alike were affected. The trees have now come to full maturity and no extensive replantings have taken place in recent years. The decrease in the crop was due to adverse climatic conditions and to the normal fluctuation following a heavy crop. The grading of all coffee for export from Bukoba is compulsory and this, coupled with field inspections carried out under the Coffee Industry (Registration and Improvement) Ordinance, resulted in over fifty per cent of the field offerings being up to F.A.Q. standard. Coffee dealers have been required gradually to effect simple improvements in the storage and the drying of the crop, and as the issue of licences is controlled by the District Coffee Board much more orderly marketing resulted. To indicate the general improvement that has taken place the following extract from trade reports are quoted: July: "New crop Bukobas have arrived and the quality shows marked improvement, particularly the arabica," and October: "the quality continues to be good and regular."

The young coffee industry in the Bugufi area continues to make satisfactory progress, and a crop of forty tons of parchment was marketed through the Bugufi Coffee Co-operative Society, Limited. The Agricultural Officer, Biharamulo, reports: "As a demonstration of advanced planting methods, coupled with simple anti-erosion measures, each coffee plot is excellent." The Biharamulo tobacco crop suffered severely through poor planting rains and only twenty tons of marketable leaf were procured. Cotton growing was extended to the Misenyi area of Bukoba and the crop promises well.

The yields of food crops were usually above normal, particularly in the lake-shore areas. Localized food shortages occurred in many areas prior to the harvesting of this season's crop.

Cotton was added to the list of economic crops which was dealt with in the Lake province native authority markets, and 15,000 tons of seed-cotton or approximately half the crop passed through them. During the year over 34,000 tons of produce was sold through these markets, at which well over £200,000 was paid out to native producers. The senior agricultural officer writes:—

"The disposal of these crops in the temporarily erected markets put a severe strain on the Lake province marketing system. It is the opinion of the staff that although this strain nearly reached the breaking point in some instances, by it the system has been shown to contain no radical faults."

Reviewing the system in the light of experience gained it is unanimously agreed that it is sound but, owing to the bulk of produce handled, the risks of contamination, and the ever present danger of fire through the use of temporary buildings constructed of reeds, poles and grass, it is imperative that permanent fire-proof structures be substituted. This is about to be done with as little delay as possible.

Details of the agricultural work and progress will be found in the report of the acting senior agricultural officer in charge of the circle (Annexure I).

NORTH-EASTERN CIRCLE.

Northern and Tanga Provinces.—The senior agricultural officer in charge of this circle is stationed at Moshi with agricultural officers at Arusha, Moshi, Lushoto, Tanga, at the Sisal Experimental Station, Ngomeni, and the Coffee Research Station, Lyamungu. Either agricultural assistants or district foremen have been maintained in the districts of Moshi, Same, Handeni and at the Sisal Station, Ngomeni. In common with other areas the planting rains were late and the main rains were prolonged and in many areas excessive. With the exception of rice, which benefited considerably, the yield of grain crops was reduced and the coffee crop, in spite of new areas coming into bearing, showed a serious decline compared with last season's record output. Small crops and low prices have not improved the financial position of the coffee planters, who in many cases have turned their attention to the production of such annual crops as cotton and maize. The sisal industry on the other hand continues to improve. The market has remained firm, with the result that development has been resumed and an increasing interest in sisal production has been evident throughout the area.

In spite of the adverse weather conditions, which increased the incidence of disease, a record cotton crop was harvested. Cotton growing in Handeni district has shown an appreciable increase, while cultivation of this crop has extended to areas west and north of the Usambaras. The large sugar estate at Arusha Chini continues to develop and a factory was opened in the middle of the year. As previously stated, the rice crop benefited from the abundant rains and a record crop was produced. The increased prices offered for copra aroused considerably more enthusiasm in its production. The palms have now recovered from the set-backs occasioned by droughts and locusts and in addition to this a large number are just reaching maturity.

The production of tea, citrus and essential oils, pyrethrum, cocoa, cinchona, oyster nuts, potatoes and onions all show steady progress and contribute largely to the welfare and prosperity of the area. Active encouragement has been given to all measures used in the combating of soil erosion, and praiseworthy results have been obtained among native cultivators, particularly on Kilimanjaro.

A comprehensive report by the senior agricultural officer in charge describing the numerous and varied agricultural activities in this circle will be found in Annexure II.

SOUTH-EASTERN CIRCLE.

Southern Province.—The senior agricultural officer is stationed at Lindi. At the beginning of the year there was an agricultural officer at Lindi and agricultural assistants at Mikindani and Songea, while district foremen were stationed at Songea, Tunduru and Kilwa. This strength was depleted in the

latter part of the year but it should be back to normal again early in 1937. The weather on the whole was favourable although on the wet side for the main native cash crop, sesame. Heavy rains in March increased the incidence of disease in tobacco and cotton, but bumper food crops were harvested in most areas. The young native coffee industry in the Matengo hills continues to progress and a start was made with cotton cultivation on the shores of Lake Nyasa. The development of the fire-cured tobacco industry in Songea has made rapid strides, and 120 tons were exported compared with 106 tons the previous year. Particular attention was paid to the quality of the leaf purchased and appreciable quantities were rejected as unfit for sale. The crop was handled by the Ngoni-Matengo Native Co-operative Union, Limited. In the coastal areas the cultivation of groundnuts, rice and cotton continues to gain ground. This province benefited considerably by the improvement in the sisal industry and the estates are now working to capacity.

The South-Eastern Circle normally produces a large surplus of grain and this year was no exception. While the actual export figures are shown at a little over 3,000 tons, large quantities are still held by the local traders for export in 1937.

An extract from a report dated the 14th November 1912 is of interest :—

“With reference to the development of the southern part of the Protectorate it may be mentioned that there are now more than thirty European planters between Lake Mkoe and the Rovuma. In 1911 there were exported from the district of Lindi :—

Plantation rubber	...	...	34 tons.
Sisal grass	...	...	994 „
Cotton	...	...	91 „

Considerable portions of the Lindi district are reported as being suitable for cotton growing especially the Lukuledi valley where experiments are being conducted based on a combination of the European plantation system and the native methods. The two drawbacks to the further development of the cotton growing industry in this district are lack of transport facilities and lack of work-people and until some solution of these difficulties presents itself there is little prospect of the cotton plantations in the Lukuledi valley being a commercial success.”

In the report for 1936 written nearly a quarter of a century later the senior agricultural officer states :—

“It is no exaggeration to state that the non-existence of reasonable district roads is a limiting factor in the development of the Lindi district.”

The details of the agricultural development and progress made during the year will be found in the report of the senior agricultural officer (Annexure III).

The remaining areas in the territory, having no circle organization, are under the direct control of head office and consist of the Eastern, Southern Highlands and Central provinces.

EASTERN PROVINCE.

Agricultural officers were stationed at Morogoro, Dar es Salaam and Mpanganya (Rufiji), with agricultural assistants at Kilosa, Morogoro and Kingolwira settlement farm. The Agricultural Assistant, Dar es Salaam, left

on leave in February and on his return in November was posted to Mafia Island. The Agricultural Assistant, Utete, was replaced by a district foreman and a cotton supervisor was stationed at Kiberege, while another was temporarily employed during the cotton marketing season in the Bagamoyo district.

In the coastal areas the rainfall was generally satisfactory and well distributed. In the Rufiji valley abnormal flooding occurred and destroyed the bulk of the rice crop, but on the other hand the flooding increased the area under *mlau* cotton which resulted in a record crop. In the hinterland the prolongation of the rains into June caused water-logging and flooding in many areas with consequent damage to crops.

Bagamoyo experienced the most successful year of its history. The cotton crop nearly doubled its previous record and the food crops were good and adequate. In common with other areas the coastal natives of this district benefited from the rise in the price of copra which has stimulated increased production. The main plantation crop is sisal and prices were good and firm, so that non-natives and natives alike enjoyed a prosperous year which has renewed hope and encouraged greater effort. A more opportune time could not have been chosen to resuscitate the island of Mafia. The main crop is copra and the recent rise in prices should assist us in our endeavours to improve the sanitation of the coconut plants, which in recent years have been sadly neglected. The department has continued experiments with kiln drying and the practicability and efficiency of two types of kilns have been proved. Kiln-dried copra gains a premium of up to two pounds per ton over sun-dried. The expansion of the cashew nut industry is fostered by free issues of seed, and there is an organized planting programme which will extend over a period of years. In view of the decision to transform part of the Botanical Gardens in Dar es Salaam into a public park many trees and shrubs, including all coconut palms, have been cut down.

In the hinterland areas the only noteworthy development is the increasing interest in sisal. Many non-native cotton estates are being planted to this crop, while the rehabilitation of abandoned estates and general improvements in machinery and expansion of planting on existing estates is everywhere in evidence. Increased cotton production was negated by adverse weather conditions and in the Kilosa area it is reported that quantities of native-planted cotton were destroyed by rats. The endeavours to increase groundnut production both as a food and cash crop are being continued.

The Kingolwira demonstration centre and settlement farm is destined to play an important part in the agricultural development not only of the Morogoro area but of the territory. Twenty-five holdings have been taken up and the native settlers have adopted in varying degrees the new methods introduced to them. Better housing, seed, livestock, implements, diet, social facilities and agriculture are all improvements which tend towards raising the standard of living and demonstrate to the natives how they should and can live by using and not abusing the resources of their land.

The agricultural and social significance of supervised native settlement or the planned reoccupation of fly-infested bush is expected to be far reaching. From the lessons learned it is today clear that in due course we should be able to go back over fully occupied country and devise means whereby fragmentation of land may be avoided, and the grouping of scattered plots in single ownership may be achieved.

IRINGA PROVINCE (now called the SOUTHERN HIGHLANDS PROVINCE).

An agricultural officer and an agricultural assistant were stationed at Itheme. An agricultural officer was stationed at Tukuyu until August but from then onwards the district was left in charge of an agricultural assistant. The area can best be dealt with in two sections. The Iringa-Njombe section and the Mbeya-Rungwe and Mufindi section.

SOUTHERN HIGHLANDS PROVINCE.

Iringa-Njombe.—In the medium altitude *miombo* areas the season was a poor one, but in the dry low areas bordering on the Central province the season was excellent and increased crop production is recorded. The development of estate agriculture is restricted through lack of adequate capital and the majority of non-native farmers just manage to eke out a bare existence. A new company known as "The Tanganyika Southern Highlands Estates," to promote the settlement of Europeans in the Ruaha basin of the Sao area, commenced operations at the close of the year. Under the present scheme the area is being partially developed and supplied with the amenities of civilization. Farms are being cut up and surveyed and roads of communication made, while grade-stock is being introduced and a model dairy and bacon factory erected. The pioneer work is being done by the company so that future settlers with the necessary capital can start farming in a comfortable way. Wheat finds a ready sale on the Lupa goldfields and a slight increase in production is recorded. Red-rust, cut worm and excessive late rains did considerable damage to the tobacco crop. The virginia fire-cured crop fell from 152,000 pounds in 1935 to 77,000 pounds this season. On the advice of this department planters are being encouraged to abandon the growing of Heavy Western in favour of the Itheme fire-cured selection. Tobacco is an irksome and expensive crop to grow and cure and many planters are abandoning its cultivation and turning to wheat. The crop of Turkish tobacco produced by two planters only amounts to 4,000 pounds of leaf. A new variety out of Xanthe, selected by the department, is making curing and growing easier and less expensive. Fruit finds a ready sale on the Lupa and its cultivation is extending. Coffee and almonds continue to be disappointing but pyrethrum shows great promise, particularly in the forest areas of Dabaga and Mufindi, where the present crop has reached six tons of dried flowers. Geranium, roses and eucalyptus for essential oils are under trial in suitable areas. In native agriculture the ready market at the Lupa for all food crops has stimulated production. Irrigation has been extended to increase rice and food production. Excessive rains reduced the yields of maize and did extensive damage to the native tobacco crop, with the result that the production of native roll tobacco fell from 12,000 to 3,000 pounds.

The south-western area comprises the Rungwe and Mbeya districts and the tea areas of Mufindi. The weather has been fickle. In Mufindi, Mbeya and Mbosi districts normal conditions prevailed. In the Rungwe area the early rains were below average but the main rains were excessive, resulting in flooding and damage to maize and rice. With the exception of estate coffee, a considerable increase in production of the main export crops is recorded. Tea production is more than double that of the previous year, due to trees reaching maturity and young trees coming into production.

The estates are in excellent upkeep and planters have settled down to a definite programme of cultivation, pruning and plucking. A survey of the tea position undertaken early in the year showed that progress was slow in the

Rungwe area owing to lack of sufficient capital, but in the Mufindi area it is anticipated that the maximum allocation would be planted up by 1938. Production figures in pounds of made tea are as follows :—

		1933		1934		1935		1936
Rungwe	...	6,720	...	15,313	...	28,924	...	46,094
Mufindi	...	—	...	3,350	...	8,589	...	60,507

The production of plantation coffee fell from 470 tons of parchment in 1935 to 343 tons in the present season. There are now approximately four thousand acres of plantation coffee in the district. The new native coffee industry continues to make steady progress. The natives are interested in this crop and the agricultural assistant reports that :—

“The plantations are well cared for, and the trees are particularly healthy and free from disease, especially in Mbosi where the standard of cultivation and the healthy and vigorous appearance of the trees is so high that European planters and visitors in the area remark on the fact, many of them with astonishment, that a group of natives can attain to such a high state of organization and almost faultless cultivation as is practised in the area.”

In spite of the weather, increases in rice and maize production were recorded owing to increased areas coming under cultivation.

CENTRAL PROVINCE.

No staff has been maintained in this province during the year although visits have been paid by the Agricultural Officer, Shinyanga, to the Singida-Mkalama areas to advise on cotton development and arrangements have been made to post a district foreman to Singida early in 1937. The cotton trials have proved successful, but development must be restricted to defined areas owing to the potential danger of the spread of the pink bollworm. In order to minimize the risks the seed is supplied annually from the pink bollworm-free area of Shinyanga, while the resultant crop is moved eastwards and ginned in the Eastern province. The main cash crop at present is groundnuts, and over 3,000 tons were exported during the present season.

EXPERIMENTAL WORK.

Research is the basis of progress and therefore the essence of it is that it should not lag behind development. The territory is now fairly well equipped with facilities for experiment and research but we have a tremendous lot of leeway to make up. Usually, a research worker, until he has established the equivalent of a Harley Street reputation for dealing with the particular work on which he is engaged, is simply tolerated by the agriculturist.

The work is becoming more and more defined and effective and of increasing importance to the territory, and we can considerably help experimentalists and research workers by extending to them our full support and co-operation and by having faith in their ability to solve our numerous problems, being hopeful of the results of their work and charitable in our observations.

The Coffee Research and Experimental Station, Lyamungu.—The Chief Scientific Officer was on vacation leave from the 29th April to the 4th December, during which period the Plant Pathologist was in charge of the station. An insectary and fumigatorium were erected and plans for the experimental coffee factory finally approved. Records of some twelve thousand trees on twenty-one estates were completed for the third successive year and bean selections on

approximately one hundred trees were undertaken. Twenty provisional selections were made of vigorous trees which have yielded on an average fifteen hundredweights of clean coffee per annum over a period of three years. These trees are all represented on the station by rooted cuttings, scions on seedling stocks and open and self-fertilized seedlings in order to permit of future work being carried out on them. In addition to this, crosses of these high yielders have been made. The steady progress which has been made in the study of the technique for field experiments on existing coffee on estates and native holdings has enabled treatments to be applied to four estates. Work has also been done on the improvement of mature coffee by "top-working." A large block for the study of shade trees has been prepared and planted up. Cover crops have received specific attention and for the convenience of planters a demonstration garden, herbarium and a card index of the various species are maintained. The collection of the various varieties of coffee continues to expand and now consists of twelve species embracing nearly one hundred types and selections. A detailed investigation of coffee soils is making useful headway, while investigations regarding the control of *Hemileia* are being continued. Reports have been issued to the public monthly throughout the year.

The Sisal Experimental Station, Mlingano.—This station, although still in its infancy, has developed along sound lines under the zealous care of Mr G. W. Lock, the agricultural officer in charge. After the building, clearing and development work that took place last year a considerable amount of tidying up had to be done this year. Apart from improvements to the general appearance of the station an extensive planting programme was undertaken. The plantation of blue sisal (*Agave amaniensis*) was extended and suckers were issued to estates in the Tanga province. Bulbils nurseries have been established in the Eastern and Southern provinces. The collection of the various varieties of agave was added to and plantings of certain species continued in order to provide material for future breeding work. Trial plots of ramie, *Mundulea suberosa*, *Derris elliptica* and citrus have also been established, and arrangements made to demonstrate the various cultural methods for sisal. Reports are issued quarterly describing the activities of this station, and full details of the experimental work and results obtained to date are published as a separate departmental bulletin.

* * * *

The under-mentioned experimental stations deal mainly with annual food and cash crops, the cultivation of which is largely confined to natives. The problems are many and varied, our aim being to gain sufficient positive knowledge about these crops, soil fertility, manures and cattle to enable us to establish some form of permanent agriculture on a sound basis and so combat the evils of overstocking, erosion, shifting cultivation and the general lowering of the natural fertility of the soils with consequent poor yields, low cash returns and low standard of living. Although the native is generally regarded as a no-cost producer, it does not follow that one is justified in carrying out large-scale experiments at his expense on the "hit or miss" principle, as nothing retards progress more in a native community than innovations which ultimately prove to be failures. As the bulk of the natives are illiterate the results of experiments have to be transmitted either verbally through the medium of *barazas*, or by the more practical and satisfactory method of ocular demonstration, which means that a seed and demonstration farm is a necessary adjunct

to an experimental station. Further it is found that not only is it beyond the natives' capacity to imitate large scale demonstrations but, on account of their size, they fail to comprehend them, so that it is necessary to reduce the area of demonstrations of improved agricultural methods to a size compatible with the native mental capacity and powers of imitation. From the results of experiments and careful field observations it was decided that the average native family consisting of three working units could efficiently manage a small mixed farm of ten arable acres provided they followed the advice of the agricultural officer. Therefore demonstration "Ideal Native Holdings" occupied by selected native cultivators have been established adjacent to the seed farms.

Where resettlement of natives is desirable owing to overcrowding, land exhaustion or the menace of tsetse, endeavours are being made to effect it on the above lines. In the Lake, Western and Eastern provinces large blocks of virgin land have been reserved for the resettlement of natives as peasant-holders under the control of this department. As previously pointed out the majority of native cultivators are illiterates and I have dealt at length with the methods of transmitting the results of experiments by ocular demonstration, which naturally entails considerable verbal explanation and discussion. The desire for knowledge on the part of natives settled on and those visiting these agricultural centres has steadily increased, and in order to meet it an adult boarding school has been established at Lubaga, while classes have been held at Ukiriguru and Nyamahona and arrangements have been made to open schools there.

The Morogoro Experimental Station.—The weather conditions were generally unfavourable and difficulty was encountered in seed germination. Owing to excessive rains maize developed leaf-streak and cotton was severely attacked by *Helopeltis*. This station is concentrating on the study of native root crops, sweet-potatoes and cassava, and (with Kingolwira) on cotton. In addition the general problems relating to mixed farming and to such crops as maize, sorghums, millets and wheat receive attention, while the propagation of such economic crops as ramie, derris, citrus and of ornamental shrubs is undertaken. Variety trials with the various types of sweet-potatoes grown by natives have shown an extraordinary degree of difference in the yields. Generally the highest yielders in terms of roots were low yielders of vines. The comparative trials of local sorghum varieties were continued and this year seed of the highest yielder was distributed to natives. Cultural experiments with food crops proved that the opening up and aeration of the soil was most beneficial to crops and resulted in higher yields, while the results of trials of green manures indicated that green manuring might be a practical proposition in this area owing to the extended rainy season and better water-holding capacity of the soil.

Comparatively little progress has been made in cotton selection work owing to the unsuitability of this station to cotton and the work is being transferred to the extension farm at Kingolwira where conditions are more suitable. Of the U4 derivatives U4 bulk has the best lint followed by the strains 955 and 998. On the results of two years, 998 appears to be the best cropper. U4 barely satisfies the increased yield requirement to balance the loss in premium and on the whole it is felt that the best line of advance is with the local cotton itself. Considerable attention is being paid to the preliminary work of the isolation of mosaic-tolerant or resistant strains of cassava. During the investigations it has been noted that plants from seed seem to develop almost as quickly as from cuttings, which is an important point in the establishment of cassava in new areas.

A dairy herd is maintained at the farm, where careful records of milk yields are kept, and surprising improvements in both conditions and milk yield have been obtained from the careful feeding of native stock. One native cow has yielded an average of six pounds of milk per day over two lactation periods of eleven months, while two other heifers have responded well to the Indian practice of four milkings per day. Originally the herd was composed of half-bred Friesians and Ayrshires with a three-quarter-bred bull, but in view of the development of peasant-holdings at the extension farm, Kingolwira, the herd was enlarged by fifteen native heifers in order to supply stock for Kingolwira when the time is propitious and risk of fly eliminated. The total herd numbers fifty beasts over a year old and they have been kept for the last two years on seventeen acres of arable land and four acres of grazing, with some roughages from the experimental plots.

A compost factory is run in conjunction with the cattle and produces 150 tons of compost per annum. In this way all the waste products of the experimental farm are made use of and turned either into milk or manure.

The Kingolwira Extension and Settlement Farm has made good progress. Over three thousand acres have been cleared or thinned of bush. Thinning includes the stumping of all species except *Acacia pallens* and a few of the very largest of the other species. The settlement area and farm have been cut off from the main fly-infested bush by a complete felled barrier one thousand one hundred yards wide and four miles long. Ten miles of rough roads have been made and the water supply extended to the prison camp, the European quarters and the African overseer's house. Labour lines for temporary labour and semi-detached houses made of sundried brick for permanent labour are nearing completion.

An innovation in the form of cooked food for the labour three times a day in place of the normal evening issue of uncooked rations has been introduced with success.

The Prison Farm.—The aim of the project is to employ short-term prisoners on the erection and upkeep of the camp which is intended to hold one hundred and fifty long-term prisoners. They will be engaged jointly with the former in cultivating food crops on the prison farm, and will at the same time receive practical training in agriculture and animal husbandry. It will afford the prisoners work under healthy conditions both from the mental and physical point of view and may prepare them for a return to the land on their release. Some will have an opportunity of occupying a full-sized holding on release and in some cases may be allowed to develop the holding under permit prior to the completion of their sentence.

The Mpanganya Experimental Station, Rufiji District.—An abnormal rise in the river caused excessive flooding and damage to experiments and structures. Concurrent with these abnormal floods the local rainfall was abnormally low, so that crops below flood-level were ruined and crops above it failed miserably through drought. Since the reopening of the station in 1934 adverse weather conditions have frustrated sound progress in experimental work, and the closing down of this station is under consideration.

The Lubaga Experimental Station, Shinyanga District.—The total rainfall was good but its distribution unsatisfactory, and considerable damage was done to the crops owing to a hot dry spell in February followed by torrential downpours in March accompanied by high winds. In April and May severe boll-shedding was recorded among all the cottons, and crops of U/4/4/2 and

955 were reduced to three or four bolls per plant. Fortunately these cottons put on a good top crop in the latter part of the season and produced satisfactory yields. Cotton variety trials were continued using U/4/4/2 as a control against U/4 selections from Barberton and Uganda Upland selections from Ukiriguru. The 998 selection again proved a superior yielder. A comparative study was made of various selections from Barberton, Gatoona, Ukiriguru, Nyasaland and local cottons and simple plant selections made of the most promising. A seed farm, ploughing school, adult school, two demonstration holdings at Lubaga and one at Ibadakuli are run as extensions to the experimental station proper. Evening classes were held twice weekly for natives wishing to attend, and a satisfactory increase in the number of natives visiting this centre is recorded. As previously stated, an adult school has been built at Lubaga and provision made for married people to attend. On the station particular attention has been paid to anti-erosion and water conservation measures with very creditable results.

The Ukiriguru Experimental Station, Mwanza District.—General weather conditions were satisfactory and high yields of the crops were obtained. Cotton trials with selections made in 1932 were continued, No. 561 again showed promise as a high yielder. Cotton crosses received from Nyasaland were planted in isolation plots, and "Over the Top— $\times$ —S.C.27" appears to suit local conditions. Trials of native sorghum again proved the superiority of certain varieties and selection work within the most promising of these has started. The results of manurial experiments to date tends to show that small annual applications of F.Y.M. are more beneficial than larger quantities applied at intervals of two or three years. Improvements have been effected in the general equipment of the farm and the conservation of water supplies.

The Nyamahona Extension and Settlement Farm, attached to Ukiriguru, is run on the same lines as the Kingolwira station attached to the Morogoro Experimental Station. Regarded purely from the point of view of a cotton extension station, it is not ideal but the selection of the site was influenced by political factors. Some relief had to be provided for the overcrowded areas to the east of Smith Sound, and the large expanse of uninhabited fly-infested bush-country to the west was already attracting settlers, particularly along the fringe of the lake-shore. In order to prevent a repetition of the overcrowding and abuse of land it was considered sound for the department to endeavour to exercise a certain amount of control over new settlement and to build up a sound agricultural policy in new country from the outset.

Nyamahona was selected as a suitable base and, as a start, approximately ten thousand acres of land were reserved for native settlement under departmental control, and portions of this area are very suitable for cotton. Extensive clearing has been done and cattle have been introduced, although their movements are restricted to the centre of the clearing in order to ensure freedom from fly. Small holdings of twenty acres have been marked out on the perimeter of the farm and one hundred and forty have been taken up and occupied by settlers. The erection of the agricultural assistant's house, office, stores, cattle *boma* and a school have been completed. A port was established at Katungura and a pier and road built largely by communal effort supervised by the agricultural assistant. A trading centre has sprung up at this port and this pioneer agricultural settlement base has now assumed some of the aspects of civilization.

The Iheme Experimental Station, Iringa District.—This station is principally concerned with tobacco but also functions as a seed multiplication farm and training centre for natives of the Iringa and Njombe districts. Pure line selection work with the variety Heavy Western was continued but, as a result of field selections, a variety called Iheme fire-cured has been fixed and has proved itself superior to this type grown under similar conditions. Experiments with fertilizers indicate that under normal local conditions dressings of twenty-eight pounds nitrogen, forty pounds P_2O_5 and thirty-six pounds K_2O can be profitably applied. Trials with several varieties of flue-cured tobacco were undertaken. No conclusive results have so far been obtained, but the South African variety, Amorello, seems the most promising in leaf texture, curing properties and growth.

Small plantings of the five best varieties of Turkish tobacco were undertaken in order to supply fresh seed to planters who may require it. Trials with rust resistant varieties of wheat and rye were continued and with such crops as barley, peas, *Pelargonium radula*, pyrethrum, *Rosa centifolia* and *Rosa damascena*, tung oil, eucalyptus oil, olives, almonds, peaches, plums, apples, pears and grape vines.

In addition to the experiments carried out at Iheme the Agricultural Assistant, Tukuyu, has continued the manurial trials in connection with the cultivation of tea. Ammonium sulphate not only shows as good results as crude sulphur against tea yellows but is a great help when applied to young tea plants in promoting vigorous growth. The coffee uniformity trials carried out in conjunction with the Coffee Research and Experimental Station, Lyamungu, were proceeded with and yields of individual coffee trees recorded.

AGRICULTURAL EDUCATION.

To bring about changes and improvements in agriculture, which is the basic industry of the territory, there are two methods of approach. The one is by legislation which compels the cultivator to comply with rules and regulations promulgated for the general benefit and protection of the industry, the other by education to improve his agricultural knowledge and understanding, so that he will voluntarily bring about the desired improvements, or at least will comprehend the reason and necessity for the legislation. The enforcement of the one without the other is not only difficult and burdensome but is irksome and unsatisfactory. An increasing interest has been taken in the agricultural education of the native, and that he is willing to learn is amply demonstrated by the numbers who immediately take advantage of any facilities in this direction which are offered.

The average number of pupils attending the Agriculture Training Centre, Nyakato (Bukoba), increased from thirty-seven to forty-four and close touch has been maintained with former pupils. The school has been the meeting place of African instructors, members of growers' associations and teachers from village schools, and a short course for adults, extending over two months, was also held. A few former pupils have been employed as instructors and the opinion has been expressed by the field officers that, thanks to their training, they are superior to any young instructors previously employed.

In addition to the training of the African instructors, the marketing staff responsible for the grading and weighing of produce in the organized native authority markets operating in the Lake province have undergone a course of training at the agricultural stations.

In the settlement areas controlled by the department, evening classes have been held throughout the year and schools are in the course of erection to provide educational facilities for the children. Here are found the nuclei—the schoolmaster, the dispenser, the policeman, the postman, the carpenter and the blacksmith—for the building up of progressive rural social centres. Several topical agricultural films have been shot by the staff of the Bantu Educational Kinema Experiment, and it is hoped in the near future to supply these rural centres with projectors and copies of these and other educational films.

PUBLICATIONS.

The following leaflet was published by the department during 1936 :—

Entomological Leaflet No. 13: "Cotton Uprooting and Burning," by W. V. Harris, Entomologist.

Other articles published during the year were as follows :—

"Cotton Stainers," by W. V. Harris, Entomologist.

"Simple Rules to Follow in the Planting and Undertaking of Field Experiments with Annual Crops, and the Reduction of the Results," by N. V. Rounce, Agricultural Officer.

"Notes on *Strophanthus Eminii*," by T. H. Marshall, Agricultural Officer.

"Peasant-Holdings," by A. J. Wakefield, Deputy Director of Agriculture.

"The Mango Fly," by W. V. Harris, Entomologist.

"A Note on Grain Fumigation," by W. V. Harris, Entomologist.

"Pyrethrum for Tea Mosquito Bug," by W. V. Harris, Entomologist.

"The Agricultural Training of Africans," by E. Harrison, C.M.G., Director of Agriculture.

"Trap Cropping for American Bollworm," by W. V. Harris, Entomologist.

"Fly Control," by W. V. Harris, Entomologist.

Articles sent to the editor of the *East African Agricultural Journal* for publishing during the year 1936 are as follows :—

"A Root Disease of Cacao," by G. B. Wallace, Plant Pathologist.

"The Conversion of Cotton Seed into Compost and the Disposal of Surplus Cotton Seed," by N. V. Rounce, Agricultural Officer.

"Bukoba Coffee : Inspection and Grading," by T. S. Jervis, Senior Agricultural Assistant.

"The Establishment and Maintenance of a Pure Supply of White Sesame Seed," by R. B. Allnutt, Agricultural Officer.

"Notes on Two Injurious Psyllids and their Control," by W. V. Harris, Entomologist.

"Groundnuts and their Cultivation," by B. J. Hartley, M.B.E., Agricultural Officer.

"Memorandum on Coffee Research and Experimentation," by S. M. Gilbert, Chief Scientific Officer.

"Some Observations on Birds Raiding Rice in Kilosa District, Tanganyika Territory," by N. R. Fuggles-Couchman, Agricultural Officer.

"Derris Root," by C. B. Garnett, Agricultural Officer.

"The Sisal Weevil," by W. V. Harris, Entomologist.

"The Unsuitability of Certain Virgin Soils to the Growth of Grain Crops," by N. V. Rounce, Agricultural Officer.

"Suggestions to Managers of Ginneries," by N. Field and P. W. Briggs, Ginnery Inspectors.

“A Useful Hedge Plant (*Pithecolobium Dulce*),” by J. Robertson, Agricultural Officer.

Other articles were as follows :—

Quarterly Notes of the Sisal Experimental Station.

Monthly Notes of the Coffee Research and Experimental Station.

SECTION III.—FINANCE.

The financial provision for the period 1st January to 31st December 1936, together with the estimated expenditure, is given below. In comparing the figures with those given in the report for 1935, attention is drawn to the fact that “Passages” and “Anti-locust Measures” no longer appear under this department’s head in the territorial accounts.

Contributions from the Colonial Development Fund amounted to £5,110 during 1936; £4,000 being for the Coffee Research Station and £1,110 for the Sisal Research Station.

An annual recurrent grant of £4,740 was again made by the Empire Cotton Growing Corporation, and of their original capital grant of £6,850 over £1,000 was expended during the year, leaving a balance in hand for 1937 of approximately £700.

The British Cotton Growing Association continues to provide the sum of £1,060 annually to pay the salaries of two ginnery inspectors for the year. Opportunity is again taken of thanking the Governors of the above bodies for their welcome financial assistance.

After making allowance for the deletion of “Passages” referred to above, the total estimated expenditure of the department (excluding the item “Special Expenditure”) shows an increase of £3,898 over 1935, of which £2,450 is accounted for under “Personal Emoluments” and £1,448 under “Other Charges.”

The following are the estimates of direct revenue secured by the department in 1936, compared with the revenue received during the two previous years :—

	1934 £		1935 £		1936 £
Bukoba Coffee Grading Fees ...	2,628	...	2,900	...	1,329*
Sisal Tax	2,464	...	4,245	...	4,135
Coffee Tax	1,600	...	2,563	...	1,837†
Cotton Tax	3,100	...	5,600	...	6,317
Totals ...	£9,792	...	15,308	...	13,618

A list of European staff as on the 31st December 1936 is given as Appendix I.

*Grading fees reduced from 40 cents to 30 cents per bag of 200 pounds as from the 1st January 1936.

†The coffee tax was reduced during 1936.

The details of the provision and expenditure referred to above are given in the following table :—

	Provision for the period 1/1/36 to 31/12/36 £	Estimated Expendi- ture for the period 1/1/36 to 31/12/36 £
<i>Personal Emoluments :—</i>		
Administrative	6,334	5,622
Scientific Staff	3,985	3,733
Field and Experiment Farm Staff ...	36,266	35,733
Total Personal Emoluments ...	£46,585	45,088
<i>Other Charges :—</i>		
Travelling (including Railway Fares and Freights, Travelling and Transport Allowances, and Transport)	9,399	8,252
Upkeep of Experimental Stations and Plantations	8,372	7,925
Upkeep of Nyakato Agricultural Training Centre	750	700
Upkeep of Ploughing Schools	200	190
Purchase of Seeds	100	83
Plant Sanitation	150	110
Purchase of Tools and Scientific Equip- ment	300	297
Expenditure on Cotton Tax Services ...	2,700	2,665
Agricultural Development, Special Services	200	178
General Expenditure (including Books of Reference, Tents and Camp Equip- ment, Uniforms for African Instructors, Typewriters, Upkeep of Museum, Agricultural Shows, Stationery, Messengers' Bicycles and Contingen- cies)	828	786
Total Other Charges ...	£22,999	21,186
<i>Special Expenditure :—</i>		
Empire Cotton Growing Corporation— Capital Grant	1,928	1,113
Sisal Experiment Station—Capital Expenditure (excluding Public Works Department work)	819	536
Coffee Research Station—Capital Expen- diture (excluding Public Works Department work)	1,000	835
Total Special Expenditure ...	£3,747	2,484

SECTION IV.—LEGISLATIVE CHANGES DURING 1936 AS AFFECTING AGRICULTURAL INDUSTRIES.

I. *Coffee*.—(i) The Coffee Industry (Registration and Improvement) Ordinance, 1928, was repealed and an ordinance to provide for the regulation and control of the coffee industry, the registration of coffee plantations and nurseries, and the establishment of a coffee board was substituted. This is termed the Coffee Industry (Registration and Improvement) Ordinance, 1936. The main differences between the two measures are : (a) The latter will apply to the whole territory unless the Governor declares that the Ordinance or any part thereof shall not apply to any part of the territory. (b) The registration of plantations and nurseries will be undertaken by agricultural officers and not district officers. (c) The use of distinguishing marks by planters and dealers may be made compulsory. (d) Licences to deal in coffee will be subject to the control of a District Licensing Board with a right of appeal to the Provincial Commissioner against a refusal to grant a licence. (e) Statutory recognition to a Coffee Board is given.

(ii) Under the above Ordinance, regulations were enacted by which the registration officer shall register coffee plantations and nurseries—the particulars of a plantation or nursery to be furnished by a planter to the registration officer—and the licence to buy, sell or otherwise deal in coffee shall be in the forms set out in the schedule to the regulations.

(iii) Under the Ordinance an application order was enacted wherein it is ordered that Parts II, IV and V of the Ordinance shall not apply to the Bukoba district in the Lake province.

(iv) A Fee Order orders that the fee payable for a licence granted under section 12 of the Ordinance shall be twenty shillings.

(v) The Drying and Storing Regulations provide for the manner in which coffee shall be dried and stored.

(vi) The Produce Export (Bukoba Coffee) (Amendment) Rules, 1936, revoked previous marks and grades of coffee intended for export from Bukoba, and give a revised description of grades and marks in specific forms.

(vii) The Coffee (Tax) (Iringa, Northern and Tanga Provinces) Order, 1936, provides for a tax being imposed on all coffee grown in the Iringa, Northern and Tanga provinces at the rate of ten shillings for clean coffee and eight shillings for parchment coffee per ton and *pro rata* for every part thereof net weight.

(viii) The Plant Pest and Disease Regulations, 1936, were enacted and specify certain host plants of the coffee borer beetle and require the removal and destruction of the plants so scheduled in such manner as may be directed.

II. *Beeswax*.—(i) An order was made which prohibits the carriage coastwise of beeswax to the ports of Kilwa and Dar es Salaam other than from the port of Kilwa to the port of Dar es Salaam, unless a written permit in that behalf by the Comptroller of Customs is first obtained.

(ii) The Customs (Importation of Beeswax Prohibition) Order prohibits the importation of beeswax into the territory, other than such as is declared, in accordance with the Customs Regulations, to be in transit. In this order the word “beeswax” does not include thin sheets of wax prepared for use as foundation combs for beehives.

(iii) The Produce Export (Beeswax) Rules, 1936, provide that all exported beeswax must be suitably packed in sealed bags and that beeswax may not be exported from the territory except in pieces not exceeding eight ounces in weight. This latter allows of easy detection of adulteration. These rules also provide for the regulation of the marking of bags containing beeswax, and further that no such beeswax shall be exported except from the ports of Dar es Salaam or Kilwa.

III. *Derris*.—An Order made under the Customs Ordinance prohibits the importation of plants of *Derris malaccensis*.

IV. *Excise*.—The Excise Duties Ordinance gives powers to impose excise duties and provides for the licensing of factories and for other matters incidental to the imposition and collection of excise duties. A schedule showing the excise duties is given for sugar (not including jaggery), tea, cigarettes and manufactured tobacco.

V. *Sisal*.—The Sisal-Hemp (Export Tax) Order provides for the levying of a tax in 1937 at the rate of Shs. 1/50 per ton or seven and a half cents for every hundredweight or part thereof net weight of sisal-hemp which is exported.

VI. *Cotton*.—Under the Cotton Ordinance, rules were made specifying the dates on which the buying of native cotton should begin in the various centres. Rules were also enacted giving the dates by which the uprooting and burning of cotton plants and residues of the season's crop should be completed.

* * * *

CONCLUSION.

The staff of the department has worked loyally and well during the year and creditable progress is noted. Mr A. J. Wakefield, Deputy Director, acted as Director for half the year with conspicuous ability. It is desired to express the thanks of the department to all those officers in the service who assist in and support its work. Co-operation is increasing and the practical help and sympathy accorded to the staff of the department by so many officials and non-officials is of prime importance in maintaining the spirit of service. I would stress particularly the increasing importance of the more intimate contacts developing between workers at Amani and the staff of this department. Also the steadily increasing measure of consultation and co-operation which is manifesting itself among agricultural workers in East and Central Africa.

E. HARRISON,
Director of Agriculture

Morogoro

7th April 1937

ANNUAL REVIEW OF THE NORTH-EASTERN CIRCLE,
NORTHERN AND TANGA PROVINCES,
FOR THE YEAR 1936.

1. *Staff*.—Throughout the year the movement or transfer of officers has affected the Moshi district only. Mr Sturdy left Moshi at the end of September to take up duty as Acting Senior Agricultural Officer, North-Western Circle. Elsewhere all officers have been in charge of their districts for the whole period unchanged. Such uninterrupted attention coupled with a good season have been extremely favourable circumstances for consolidating and getting results from the groundwork laid down in previous years.

2. The African instructor staff has been increased, chiefly to meet the demand for more instruction and demonstration against soil erosion. A number of this staff was posted for apprenticeship to Kilimanjaro for varying periods before taking up duties in their districts. Wherever possible native administrations have assisted in bringing the numbers required up to the needs of their area. During the early months of the cropping season temporary instructors were taken on in all districts.

3. The assistance given from Moshi to the development of the Taveta area of Kenya Colony has continued. Opportunities occurred of meeting the Deputy Director of Agriculture, Kenya, the Agricultural Officer from Kilifi and also officers of the Kenya Administration on several occasions. The progress and direction of the work has, therefore, been thoroughly discussed on the spot.

4. *Weather and Rainfall*.—The rainfall has been the heaviest for many years. The short rains were late at the end of last year but continued through January and February until the long rains set in. Very satisfactory crops were secured from these areas which rely upon the short rains season. The greater part of the countryside depends upon the long rains and these commenced at the regular time but were prolonged. The absence, however, of a definite break between the two rainy seasons made the preparation of land for the main rains planting a difficult and comparatively costly business, at least three times as much work being involved.

5. In many areas the amount of rain was excessive and the cool season lasted far longer than is general. These conditions gave the impression that the land was saturated and lifeless for the time being. On the upper areas of Kilimanjaro and Meru this was most noticeable, as growth seemed to be at a standstill.

6. An exceptionally heavy burst of rain occurred in May around Mombo and Korogwe putting the railway out of action for a week and the main roads in the southern half of the mountains were blocked by landslides for a month. Considerable damage was caused to native farms and blocks of sisal which lay in the path of the storm. After the exceptionally heavy long rains the short rains at the end of the year were again late.

7. *General Remarks on Crop Production*.—Whilst the yields of food crops in the short rains planting areas were excellent, those in the long rains were disappointing with the exception of rice, which was especially good. Following

on the good season of last year there was a considerable extension in the area under rice and growers are emphatic that the crop this year was the best ever harvested. Although the prolonged rain was responsible for reducing the yield of grain crops in most areas this was more than offset in other directions. It has enabled the districts which periodically are in difficulties on account of drought to rehabilitate themselves with good stores of food and thoroughly establish their plantings of drought resistant crops such as cassava and sweet potatoes. There was great benefit to the vast grazing areas of the stock-owners, to the pasturage as well as to the vital water supplies. The pastoralists had suffered severely in recent years and their stock have only now recovered their condition. Perennial crops such as coconuts and citrus, which were recovering after severe defoliation by locusts, have had another good season and borne well. Generally speaking the agriculturists on the plains have had the advantage this year over those living in the cool upcountry districts when more often the opposite is the case.

8. The output of sisal and twine has been maintained, despite the fact that halfway through the year the production was down by one thousand six hundred tons. This was partly due to the heavy rains making transport and drying of the fibre difficult. Also there was a heavy call on a labour force, already short, to make up leeway caused by so many estates being unable to maintain their planting programme during the slump. Fortunately the circumstances which interfered with production in the early months did not continue and the fear that there would be a further substantial falling off as the year went on did not materialize. This is another instance of the way in which the sisal industry will overcome the difficulties it meets. The hope that the price of sisal would remain stable after the sudden rise over a year and a half ago has been fulfilled and there is a feeling of confidence as to the future. The resulting prosperity will have a marked effect on development particularly when the reorganization taking place to secure an adequate labour supply becomes fully effective. The opening of new land and replanting in the main sisal area is proceeding and perhaps the most notable new activity is taking place in the Same, Moshi and Arusha districts where there is land which for cheapness of clearing and maintaining cannot be surpassed. Such development will not affect production for the next few years.

9. The coffee crop has fallen to nearly a half of last year's record season in spite of the coming into bearing of areas in the Mbulu district. Although this season is the "off season" the remarkable drop in the yield must be attributed to unfavourable weather. With the lateness of the short rains until the very end of last year flowering occurred unseasonally over a period through January into February. There was a succession of heavy flowerings, a great deal of which did not set. There was no cherry fall to speak of. It is significant that in the Bukoba district, which has an earlier season than we have here, there has been a similar happening. An interesting correlation between the production in the two areas might be deduced. Analyses of the sunshine records at the Coffee Research Station reveals that over the whole year there has been more sunshine than last year. Dull days have been fewer even though there has been more rain. The effects of this may be expected to influence the trees and so next year's crop more than the current one. It is stated, however, that the quality in general this year is better than last year and that the coffee is heavier. It is reported from most areas that the trees have finished the season in very good condition.

10. The short crop with prices still low in the early markets continues to make matters more difficult than ever for the coffee planter. The better conditions in neighbouring plantation industries does not help, since wages tend to increase and the price of food for labourers has gone up. It is difficult to see how the industry continues in the face of such difficulties but the spirit which prevails is exemplified by the president of the Coffee Growers' Association who, remarking on the old saying that it takes a lean horse to win a long race, said that the coffee industry was lean enough in all conscience but he felt certain that it was a horse that would win out. It is certain that some of the lean horses must drop out if prices continue as they are today and others can only stay in by reducing the weight on their backs. In the marginal lands alternative crops and mixed farming must be gone in for, cotton having already replaced coffee in one area. Although as the season continued prices have risen this year's lesson has been that it is only by securing a regular high standard of yield that the industry can be put on a safe footing. The reason for the erratic yields and the means of improvement is one of the early pieces of research being carried out at the Coffee Research Station.

11. The production of plantation maize is below that of last year although the acreage has not been reduced. Too much rain at the time the crop was maturing accompanied by the prolonged cool spell had an adverse effect on yields. Pink rot was also more evident than it has been before. Growers were heavily handicapped because of the absence of normally dry weather in January and February in which to prepare their ground. The heavy work involved in coping with a vigorous weed growth retarded planting operations. The native crop suffered similarly and there was very little surplus for sale. The very poor price last season gave no inducement and there was much less planted over and above maintenance requirements. The shortfall has brought about a rise of more than double last year's price in the local market. The Kenya Farmers' Association have continued with their services, the main feature this year being the erection of a railside godown at Moshi with an office. There is a very great deal yet to be done towards organizing the local industry. Progress is extremely slow owing to the many difficulties in getting growers to co-operate. There is ample and magnificent land for maize production not only in the Moshi but also in the Arusha and Mbulu districts. There is also a substantial consuming market in the near-by coffee and sisal plantations. Yet, owing to lack of organization and an intelligent anticipation of requirements on the part of growers and consumers, the maize position alternates between a feast and a famine in season and out of season. With a view to organizing the production of surplus native-grown maize as well as other export crops the Agricultural Officer, Arusha, paid a visit to Kenya to study the workings of the Native Produce Marketing and Inspection Rules.

12. The cotton crop is easily a record. Yields would have been better had the weather been more favourable. The young plantation industry in the Mbulu district encountered more set-backs than elsewhere. The unusually wet conditions followed by cool weather made the preparation of land difficult and early growth was long and lanky. Planting began early and was long drawn out. During June there was a heavy attack of American bollworm; later the infestation passed off and planters were able to flush their crops with an irrigation which brought on a fresh flowering. With the arrival of warm weather in August the outlook had changed entirely and a moderate crop was secured. In contrast to this the native plantings on the adjacent dry flats

obtained very much better results. A few plantations have taken up cotton growing in the lower Arusha district and further development has taken place in the Moshi area.

13. Generally speaking the native crop in all areas has been the best for many years, those who planted cotton are very satisfied with the cash return they have had for their work. In the Handeni district, which experienced famine conditions two years ago, a most outstanding recovery has taken place in the short period. The agricultural officer states that : "The improved health and stamina of the people is very noticeable and a large proportion of the people who left the district during the famine have returned." Good supplies of food crops, with ample plantings of cassava as an insurance, have been secured. The cotton crop which is double that of any previous total has enabled the people to obtain much needed cash ; no district is more eminently suited to cotton than this one. With the distribution of new introductions of quick-maturing food crops for the unreliable short rains it only requires another good season to further consolidate the position which has been gained by careful supervision, encouragement and hard work.

14. The good season of last year has also stimulated cotton planting in the Moshi, Same and Lushoto districts. To the west and north of the Usambaras some two thousand natives took up cotton cultivation for the first time and received a very fair reward for their first attempt. In all areas there is still room for improvement in the standard of cultivation. As the growers become more familiar with the crop progress can be confidently looked for. Adequate advisory staff has been provided in all areas.

15. Notable development on the large sugar estate at Arusha Chini in the Moshi district is to be reported. A factory for the production of both yellow and refined sugar was completed and commenced work in the middle of the year. Over a thousand acres of cane are established and the expectations based on high yields in the early trials have been fulfilled. An important consideration as to the number of times the cane can be profitably ratooned before replanting has yet to be found out. It is proposed that cotton shall come into rotation with sugar in due course. The health and vigour of the sugar-cane, which is of Java origin, continue to be excellent.

16. During the past year yet another distribution of Kenya Governor wheat was made, on this occasion to farmers in Engare Ol Motoni, Engare-Nairobi and to native growers in the Arusha and Mbulu districts. The resulting crop will be sufficient for considerable extension next season. On the subject of wheat the Agricultural Officer, Arusha, writes : "Wheat is, I think, destined to play an important part in the native farming programme in the highland areas, where it can be planted at the end of the rains to grow in the cold dry season which is unsuitable for the quick growth of the other local cereals such as maize and millets." Of the plantation industry he writes as follows : "The position of wheat production among the farmers on the western, northern and north-eastern sides of the mountain remains most unsatisfactory. In these areas we have wheat and mixed farming land of great potential value, and comprising not less than fifty-six thousand acres, but the output of stock products, wheat and potatoes which one might expect from such an area is comparatively insignificant. Wheat with its valuable residues of straw and milling offals should provide an important feature of cropping in this mixed farming area, but farmers do not buy millers' offals and do not seem to be content with a return for wheat of less than eighteen shillings a sack. The

farmers fear that an increase in acreage will glut the market and bring prices down; they do not appreciate the fact that if the local miller could get supplies of grain at reasonable prices he would be able to develop his trade and break in on the lower grades of flour which sell on the Tanga line at about twenty-five shillings a sack." New types for this area have been kindly promised by the Senior Plant Breeder, Njoro, for trial during the coming year.

17. With a second year's bountiful rainfall the rice crop has beaten all records in the chief areas of production in the Same, Korogwe, Pangani and Tanga districts and in parts surrounding the Nguu hills of Handeni. The way in which both last year and this cultivators have planted up every available piece of land to rice is surprising, because it is only in years such as these that certain areas can be put into commission. It appears to be a crop very much to their liking and scarcely any other crop gives them so much satisfaction as a bumper rice crop. Officers in the Korogwe and Same districts have continued with the demarcation of swamps into regular plots where previously haphazard and irregular cultivation was responsible for much waste of good land. Coincident with this, special attention has been paid to the command of irrigation water and its most economic usage. Ten tons of good quality rice seed were issued to the Korogwe district to replace inferior and mixed strains and a seed selection campaign begun in 1935 in the Tanga district is showing good results. Fifty pounds were spent by the native treasury on the extension of an irrigation system which came into service in November. The possibilities therefore of development of this important food and cash crop are most promising and should be a valuable asset to the sisal plantations.

18. Among other crops attention has been given to the introduction of groundnuts, millets, beans and vegetables in selected areas. In the Usambara mountains the cultivation of European potatoes by the natives is general. The surplus for export has increased regularly each year. They have adopted potatoes as a part of their normal food and in providing vegetable seeds it is desired that they should use these crops in the same way as they have potatoes.

19. The native onion industry on Kilimanjaro has increased, the export this year being nearly one hundred and fifty tons more than last year. The crop is extending into districts which had not grown it before. In the Arusha district this product has found a useful outlet to the Central line, thus avoiding the markets catered for by the Moshi growers.

20. There was a large increase in the export of copra, amounting to 260 per cent in bulk and 375 per cent in value. The increased yield is due to the recovery of the palms from the drought and locusts in 1933 and 1934. Besides this, large numbers of palms are just maturing. The industry has been much stimulated by the rise in price. The heavy rains caused difficulty in the preparation of copra. The local soap works take a percentage of the crop and a factory to manufacture edible oils is nearing completion. Drying kilns of the latest type have been installed and fresh nuts will be purchased from the growers.

21. The Muheza orange crop was the best for three years. A glut of fruit threatened but fortunately the Mombasa and Nairobi markets came in and matters improved. The exploration of the Bombay market last year with a trial consignment of oranges was disappointing. Competition from the larger and better South African and Rhodesian supplies could not be faced with fruit from seedling trees. Further valuable work has been undertaken by the Agricultural Officer, Tanga, at the citrus station. The point has been reached when sound advice can be given as to the varieties and understocks which can be relied upon

to suit local conditions. This applies to grapefruit as well as oranges. Far more interest in citrus is being taken by planters and it is hoped that development will take place. Native workers trained in the nursery at the station are available. The export of bitter orange equellor oil from one estate has increased. The market has remained firm and this particular oil has been well received in London, being superior to the same type obtained elsewhere.

22. There was a rise in the export of kapok, but the crop this year has been disappointing due to the good flowering being spoiled by rain. A considerable acreage of young trees has been planted and it will be some years before any large increase in output can be looked for.

23. At the end of the year forty acres of pyrethrum, a potential industry in certain areas of the Arusha district, had been established. Small-scale trials over the past two years have been promising enough to warrant development. The transition from the garden stage to a commercial one is presenting difficulties. An outlet for dried flowers to the Kenya mills is a possibility. At present there is no press and dried flowers loosely packed appear to pick up moisture very readily. Experiments are being carried out to prepare a suitable article for dusting purposes through a common maize mill. The material for the preparation of an extract can, however, be supplied without any difficulty and its success will depend largely on the local demand. Every effort is being made to foster this project which is a useful sideline in the mixed farming areas at the higher altitudes.

24. It is interesting to note that the volume of trade at the port of Tanga showed an increase of sixty per cent over the previous year. The value of imports was thirty per cent up, that of exports by more than seventy per cent.

25. *Soil Erosion*.—During the past year, particularly on Kilimanjaro where soil erosion rules covering all the occupied land have been in operation under the native authority, even better progress has been made than we anticipated. In last year's report reference was made to a film dealing with "Soil Improvement" which not only covered the erosion problem but went further. This film prepared at Moshi by the Bantu Educational Kinema Experiment, with the assistance of the agricultural officer and his staff, was afterwards displayed widely to native audiences in East Africa. Of this film the Field Director wrote: "The point of particular interest is that the most popular film throughout Kenya was a film we produced at Moshi on the subject of 'Soil Improvement.' It was not a good film, we consider, but, nevertheless, the audience stated again and again that it was their first choice in a mixed programme of educational and entertainment films. It would seem that the film clearly explained what they had only been vaguely able to understand previously. Members of the native audience have explained to us what they learnt from the film which has been encouragingly accurate. Others who have subsequently discussed the films with natives have reported the same." We could not have two more encouraging instances to push ahead along the lines that have been laid down. Success in this work on the scale in which it must be done is attained only by the co-operation of the Provincial Administration, the native authorities and the staff of this department. This team work in carrying out the propaganda and demonstration is vital. In work of this nature we find time after time that the progress made depends very largely on the initiative and keenness on the welfare of their district shown by the chief and his elders. How much depends upon the leaders of the people can scarcely be realized.

26. That the matter of putting things right should not be so difficult is proved by the number of scattered examples we have in these provinces of good soil preserving practices which either have been or are being carried out of their own accord by peasant cultivators without any previous demonstration. In the Kainam area of the Mbulu highlands lives a tribe of agriculturists whose methods today to prevent soil loss are perfect; added to this they carefully manure their crops. The area is heavily populated and the overflow on to new lands in the vicinity are abandoning the efficient practices adopted in the heavily-populated area to which the tribe was originally confined. On Mount Meru in the native areas erosion is already practically non-existent. This situation has been brought about through the enclosure of cultivators' plots with hedges. The initiative came from the cultivators themselves who saw the advantage of enclosing their kikuyu grass paddocks and arable fields. In the upper areas of Kilimanjaro the old plots were similarly fenced off with hedges and even stone walls were built. In the Pare mountains there are extensive remains of stone terraces used by a bygone generation. These have been carelessly broken down in many instances by the present generation.

27. On the erosion experiment at the Coffee Research Station the use of live hedges across the slope proved to be a most effective measure to prevent erosion, second only to the use of a soil cover. Such measures are well within the scope of the native cultivator particularly as suitable hedge material of many indigenous kinds is readily accessible to him. Also in areas of fair rainfall the land quickly takes on a weed cover. The adoption of such hedges, augmented by the laying on the contour of vegetation obtained in the course of preparation of the land, is the basis of the demonstrational work carried out. Cultivation on slopes so steep that erosion is inevitable is prohibited. Demonstrations followed by rules to enforce adequate protection of native coffee *shambas* were the first to be taken and have been in existence some years. As mentioned in last year's review, activities have been centred to cover all cultivations. One of the most striking demonstrations in the field, calculated to appeal to the natives, occurred in the irrigated eleusine fields on Kilimanjaro. Against the contour barriers put across the fields the millet growth was remarkably better than anywhere else. It is as well that one of the most dangerous methods of native husbandry on Kilimanjaro, that of flooding the eleusine fields, should have yielded such desirable ocular proof. It is so often that happenings of this kind turn up and give greater impetus than carefully planned efforts.

28. With an increase this year in the staff of instructors specially trained in erosion demonstration on Kilimanjaro much work has been done in the west Usambara and Pare mountains. In the former district seven coffee instructors were also responsible for erosion work in their areas; in addition sixteen others, of which seven were provided by the native treasury, were engaged on it. Without demonstrations being followed up by personal contacts little good results, though meetings are held in all areas to further the propaganda. To overcome the indifference of the womenfolk is not easy but it is remarkable on Kilimanjaro how well they have responded. In the Pare mountains six instructors have given their whole time to the work. On Mount Meru a move has been made to see to the enclosure and hedging of all the remaining plots in the thickly populated areas. To the Sonjo tribal area west of Arusha the agricultural officer paid a visit which is being followed with large scale demonstrations.

29. Following upon the demonstration work outlined above, simple native authority rules have been drawn up for the Usambara, Pare and Meru areas. These proposals have been put before the people and their leaders and accepted by them. It is hoped that these protective measures will be approved by Government and brought into being early in the new year. Progress made during the year can be regarded, therefore, as highly satisfactory. Although there is yet a tremendous amount to be achieved a thoroughly comprehensive campaign has been launched. It is the maintaining intact of the measures being carried out by cultivators that is every bit as important as work yet to be done in the near future. The boundaries demarcating steep valleys have been well observed and few prosecutions have been necessary.

30. In spite of propaganda, special meetings and demonstrations of the past few years to the planting community, the reaction generally has not fulfilled expectations. With regard to the coffee planter, in particular, there is convincing proof today in the findings of the experiment at the Research Station. Even so the possibility of tons of soil an acre being lost on a moderate slope is too often met by the consoling thought that such a thing does not occur on "my *shamba*." Far too much reliance is placed on the fact that plantations generally carry a weed cover in the rainy season. It is useful but it is not sufficient. Fortunately there are a few outstanding exceptions, progressive farmers who have laid out model anti-erosion measures.

31. *Marketing*.—Last year an outline was given of the various crop organizations and their activities towards marketing problems. These concerned sisal, coffee, maize and perishable farm produce. The feature of the year has been the Johannesburg Empire Exhibition as a means of placing our products before the South African buyers and consumers. It is premature yet to hazard an opinion from the contacts that have been made as to what extensions are to be anticipated in this market. Much care and organization has been given by the sisal and coffee associations. Coffee interests at the exhibition were organized on an inter-territorial basis working in close union with the Kenya and Uganda boards.

32. As last year the native coffee of the Kilimanjaro Native Co-operative Union effected forward sales and gave satisfaction with a good standard quality. The bulk of this coffee finds its way to American and Canadian consumers. The marketing of the Arusha native coffee has been put on a more satisfactory basis. The previous organization of these growers had not been satisfactory chiefly because it was too advanced for them. Mainly by the efforts of the district officer, confidence in the new organization has been established. Two simple associations have been properly constituted with bye-laws. The crop has been sold by tender, dealers submitting tenders at the monthly sales. In the Usambaras the scattered nature of the native coffee centres renders group marketing difficult. At the main centre, however, the growers continued to co-operate, forming an association and adopting the Arusha bye-laws which were almost identical with those they had themselves been working under for over a year. The small crop was sold to the highest bidder. Under the Coffee Industry Regulations, 1936, district licensing boards were set up. It is the business of these boards to grant licences to reputable coffee dealers.

33. The marketing of plantation maize is not yet fully organized. Last year's low prices had a disturbing effect and this year prices soared up owing to the small amount on offer. The Maize Growers' Association only began last year and although considerable advances in the working of it was hoped for during this year it has not been possible to carry them through.

34. Close supervision has been given to the marketing of cotton in all areas. The grading of cotton was altered throughout, there being only two grades instead of three. This proved very satisfactory. With the increase obtained this year a reorganization of the marketing system is called for. More frequent markets will be necessary. Prices, which were in advance of last year, were paid according to the promulgated scale.

35. Assistance has recently been given to the dairy farmers by the railway authorities placing a cool box on the Arusha-Tanga service. This allows of butter being put on the Tanga market and intermediate points in excellent condition.

36. The Usambara Farmers' Produce Company erected a cold store in Tanga which was completed in September. The capacity is sufficient to supply boats passing through Tanga with about eight tons of vegetables, fruit, pork products and potatoes. Certain shipping lines now take consignments regularly and it is hoped to extend the supply to other lines.

BOARDS.

37. *Sisal Board*.—Meetings of the board were held at Tanga during the year. In disbursing the funds derived from the cess on the industry the board is concerned with a part of the cost of the Sisal Experimental Station, the local association and the recently formed London Association and also with sisal research overseas through the board of trustees. By means of a joint committee liaison is effected between this Board and the Kenya Sisal Association.

38. *Coffee Board*.—During the year a statutory Coffee Board was set up under powers conferred by the Coffee Industry (Registration and Improvement) Ordinance 1936. The board held three meetings. Its constitution comprises three officials and six unofficials nominated by the Tanganyika Coffee Growers' Association and approved by the Governor. A secretary is appointed by the board. Its functions are somewhat similar to those of the Sisal Board. The management committee of the Tanganyika Coffee Growers' Association places before the board all interests connected with the industry. To effect co-operation with bodies representative of the coffee industry of other East African territories the East African Producers' Committee was constituted during the year. This committee deals with all matters brought before it by the respective Coffee Boards. Subjects of special note dealt with by the board were coffee publicity for East Africa, the Johannesburg Exhibition and coffee research.

CROPS AND CULTIVATION IN DETAIL.

39. *Sisal*.—The following are the exports over the past four years:—

Province			1933 Tons		1934 Tons		1935 Tons		1936 Tons
Tanga	...	...	45,329	...	40,614	...	47,536	...	45,763
Northern	...	...	2,490	...	2,644	...	2,619	...	3,039
Totals			47,819	...	43,258	...	50,155	...	48,802

Besides this, 2,316 tons of twine and cordage valued at £75,717 were exported as against 1,730 tons in 1935 valued at £44,666.

40. The combined totals of raw fibre and twine amounted, therefore, to 51,118 tons. The year has been a good one for the industry because the price has been maintained after the remarkable rise last year. Considering that the season's grain harvests in America and Canada have not been good this firm tendency in the market is noteworthy. Prospects for the future are bright since stocks are low; production will not be greatly increased and it is reported that the new season's wheat acreage in the American continent is the largest on record.

41. With the improvement in the market the industry has seized the opportunity for forging ahead with its organization. A new committee has been set up in London by the Tanganyika Sisal Growers' Association. Research work overseas for the purpose of sisal utilization and the agronomic research in this country are being actively pursued. Besides this, estates are able to give increasing attention to their maintenance, new installation and renewal of machinery and development in the field. The labour position which was causing difficulty at the beginning of the year improved towards the end. Reorganization of the labour supply is in train and should lead to further improvement. The electric power installation is completed for the main producing areas. The industry is clearly in a very strong position.

42. In the Tanga province three large sisal estates were sold and grouped into one new company. In the Same district the building of three new factories on estates not previously producing are nearing completion. On all estates in the latter area substantial new plantings have been carried out. A small estate has changed hands and progress is expected. Similar development is occurring in the Moshi district where there are certain to be further fresh plantings on a big scale. Three estates were in production in the Arusha district at the end of the year. A new area of development amounting to some twenty thousand acres is being applied for. It has already been proved as an area for sisal and has the advantage of comparatively inexpensive clearing. The developments noted above are bound to have repercussions on the neighbouring coffee producers who are still struggling to make ends meet.

43. The twenty-two acres of blue sisal on the Mlingano Experimental Station has made astonishingly vigorous growth. It should be ready for cutting soon and will supply adequate fibre for a commercial test. Distribution of bulbils from Amani and suckers from Mlingano has been effected through the Sisal Growers' Association to a number of estates both in Kenya and Tanganyika.

44. *Sisal Experimental Station.*—A report for the station is given separately, giving the development and progress of the experimental work. One noteworthy feature has been the very favourable weather for planting out all the experiments. As a result the success in establishing uniform material has been almost perfect. Buildings, with the exception of the factory and machinery, are completed and the water problem has been solved. Another feature is that different treatments are already yielding useful information. In the cultivation trial uncontrolled weed growth is adversely affecting growth. As planting material bulbils are showing significantly more rapid growth than suckers. It remains to be proved whether this start is maintained. Planters are co-operating with the staff on various trials on their estates on mature sisal in regard to plant treatment, leaf characteristics and fibre yield. In this agronomic research close touch is maintained with Amani.

45. *Coffec*.—The following are the amounts of parchment coffee produced for export over the last four years, by districts :—

District	1933 Tons		1934 Tons		1935 Tons		1936 Tons
Arusha (with Mbulu) ...	2,223	...	1,316	...	2,914	...	2,577
Moshi ...	2,387	...	2,891	...	4,336	...	3,269
Usambara ...	166	...	172	...	179	...	118
Totals ...	4,775	...	4,379	...	7,429	...	5,964

46. These amounts were railed via Tanga or Kilindini as follows :—

Port	1933 Tons		1934 Tons		1935 Tons		1936 Tons
Tanga ...	1,726	...	1,194	...	2,084	...	1,803
Kilindini ...	3,049	...	3,185	...	5,345	...	4,161
Totals ...	4,775	...	4,379	...	7,429	...	5,964

47. The amounts of (A) estate and (B) native coffee produced for export over the past four years are as follows :—

District	1933 Tons		1934 Tons		1935 Tons		1936 Tons	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Arusha...	2,123	100	1,271	45	2,829	85	2,529	48
Moshi ...	1,378	1,008	1,361	1,530	2,418	1,918	2,322	947
Usambara	151	15	152	20	167	12	106	12
Totals ...	3,652	1,123	2,784	1,595	5,414	2,015	4,957	1,007
Grand Totals	4,775		4,379		7,429		5,964	

48. The coffee season has been a very disappointing one and has added to the burden which the planting community has been carrying for the last four years. The figures given in the above table represent the yearly total and therefore comprise half of last season's and half of this season's crop. The true state of the current season's crop is masked by the carry-over. There is included in the Arusha district total the crop from Oldeani which is a new area coming into production with a substantial increase, and this also masks the output from the more mature Arusha and Usa areas. As was reported last year, very many trees bore too heavy a crop and finished the season in an exhausted condition. Added to this, flowering was unseasonably late and was followed by wet and cold weather. With the light crop this year trees have picked up condition and look well. Certain estates as usual have continued to produce their consistent yields. The industry plunged in the depths of a depression cannot be expected to maintain interest in a high standard of cultivation. The difficulty is increased by the trend of prosperity in all other commodities causing plantation expenses to be correspondingly greater. It is to be hoped that the coming season will be the turning point. Failing this, areas must go out of coffee cultivation and be turned to other uses.

49. *Native Coffee*.—The Kilimanjaro and Meru native coffee crop has dropped to a half the record set up last year, the quality of the crop, however, has not suffered. It is reported that the middle belt has been most affected by the shortfall. With the steady education and supervision, progress on the cultural side of native coffee cultivation continues to be maintained. Inspections

by the agricultural assistants and their staff have been carried out on forty-eight thousand five hundred plots during the year. The cultural side is further catered for by the staff of the Kilimanjaro Native Co-operative Union with which this department works in close touch. The efficiency of our native staff is progressing and although it is mainly concerned with advisory work for the benefit of coffee growers has also other responsibilities. The Agricultural Assistant, West Kilimanjaro, writes : "The native instructor staff are becoming more efficient and capable and are responding well to the greater diversity of work as compared with that of a few years ago. The teaching and training of pupil instructors was continued and a number of promising men recruited to the staff. Instructors from other districts were posted here for several months of instruction in coffee, anti-erosion work and general agriculture."

50. There has been no significant increase in new planting either on Mount Meru or in the Mbulu district. The inspection and instructional work given to the Western Usambara growers has been more continuous than hitherto. In the main centre at Vuga the growers have formed themselves into a simple association which graded and marketed the coffee and obtained reasonably good prices. The movement is being fostered and should encourage the other areas to follow suit.

51. *Coffee Pests and Diseases*.—Weather conditions were not good for getting the best results from spraying and the season was favourable for *hemileia*, which caused heavy leaf fall in some areas. Much of the crop turned to *buni* on the unsprayed plantations. Block spraying against *antestia* was carried through on Kilimanjaro and Meru. A period occurred late in the year with dry conditions and unusually high temperatures conducive of a thrips attack. In anticipation of this an early warning was issued by the Entomologist. The crisis passed off. The annual borer campaign on native coffee has been satisfactorily carried out. Details giving counts of the borer population show that a very safe figure has been reached. Each year an improvement is recorded and in the near future the incidence should be insignificant. This sound position is a great achievement reached by very thorough supervision over a number of years. With the exception of a few misguided and obstinate cases, borer on estates is well controlled. Eradication of the wild host plants continues. Counts of larvæ in these have proved conclusively that an exaggerated opinion has been held by some as to the danger from this quarter. Leaf miner has been troublesome in parts of Kilimanjaro and causes anxiety to planters.

52. The Plant Pathologist visited the Usambaras and continued his investigations into the relationship between a mealy bug and collar rot.

53. *Experimental*.—The work of the Coffee Research Station is dealt with by the Chief Scientific Officer. Mr Sturdy has prepared a report on his work on root observations on the Selian Shade Experiment at Arusha, this is to be published shortly. Conclusions which emerge from his work are :—

(1) In the open surface feeder root development is hindered by factors not operative under shade. Three of these limiting factors are suggested as being—

- (a) high surface soil temperatures ;
- (b) poor aeration during the rains ; and
- (c) rapid drying out in the dry season.

(2) Maximum feeder root development is favoured under shade and occurs in the first 25cm. of soil, whereas in the open it occurs at a greater depth.

(3) Fully shaded trees have four times the quantity of feeder roots at the surface and three times the quantity throughout the whole profile than unshaded trees.

(4) The ratio of surface feeder roots to—

(a) aerial parts ;

(b) total root ; and

(c) to a five-year crop,

is very considerably less for the shaded trees.

Mr Sturdy summarizes by saying :—

“There seems ample evidence to suppose that the larger and more surface feeding root system of a shaded tree is to a great extent the explanation why shaded coffee in this experiment has been least prone to yellowing, overbearing and dieback.”

54. *Coffee Curing Works*.—The quality of the curing turned out by the Moshi factory this year shows a decided improvement. This was to be expected, bearing in mind the difficulties which attend the operation of any type of factory in its earliest stages. Confidence in the local works is growing and with this the quantity of coffee consigned to it for treatment is bound to increase steadily. Curing charges are very reasonable. Valuable assistance was given by these works in the preparation of an excellent blend of coffee for use in the East African pavilion at the exhibition.

55. *Tea*.—An increase in the quantity of made tea is recorded from the Usambaras where one large estate is in production and manufactures also the green leaf from a small block on a neighbouring estate. The total manufactured this year was 98,925 pounds. Almost the whole of this is consumed in the local market. Areas which had been rested for a short period were brought into plucking. An extensive area has been pruned this year and there should be a good yield of leaf for next season. Improvements have been made to the factory and a new withering loft has been put up. Root disease which was troublesome in the early years appears to be working itself out slowly. Replanting to make good the losses has been carried out and the over-wide spacing corrected. More attention is being given to the prevention of soil wash ; clean weeding in the rains has been abandoned. An advance in the organization of the industry took place this year when an East African tea association was constituted represented by Nyasaland, Tanganyika, Kenya and Uganda.

56. *Cocoa*.—The export of 5·4 tons of cocoa, valued at £270, from the Tanga district is lower than for some time. It is the product mainly of one estate, another small estate having borne a crop for the first time. Kapok trees as a shade prove to be quite unsuitable on account of their deciduous habit when protection is most necessary. A new cocoa plantation of fifteen thousand trees is contemplated for a selected valley. The district in general is not favoured by a regular and ample rainfall without annual recurrences of a dry period. Even in the selected valleys weather conditions of 1933 and 1934 had a very adverse effect on the trees.

57. *Kapok*.—The crop is greater than last year, being 87·6 tons as against 72·8 tons. The production is still low, nevertheless, and is due to good flowering having been spoiled by rain. The Tanga and Korogwe districts are the centres of interest. Very little extension of planting occurred this year though there is much young kapok which has not yet come into bearing. The extensive

plantings in past years is partly due to its being a relatively easy crop to grow. Because of this there is a tendency to give little or no attention to the trees when young against competitive weed growth and there is no doubt that this is detrimental. Plantations of old trees have come to the end of their economic life and are being cut out and replanted. A local market to absorb a fair supply exists.

58. *Cinchona*.—Renewed interest in this crop is taking place in the Usambaras. Pre-war plantings on a number of estates have for some years been yielding druggists' bark to the London market with very profitable returns, particularly as the present owners have had to bear no cost other than that of harvesting. Roughly five tons of bark from hybrid trees have been sold, fetching seven and a halfpence a pound. As a result of recommendations made at the Amani Conference this year this department is to establish central nurseries of varieties of cinchona for supplying seedlings to estates. The raising of young plants hitherto proved a stumbling block; one planter in the Usambaras has, however, succeeded in establishing large nurseries. There is no doubt as to the suitability of cinchona growing for many of the coffee plantations but lack of confidence as to the future, coupled with the long wait for a return, is causing delay; also supplies of good ledger strain are not available yet.

59. *Copra*.—The yield of coconuts has been good this year with the recovery of palms after two good seasons and a number of young palms just coming into bearing. The export of copra, which had dropped to the low level of 560 tons valued at £4,399, has risen this year to 1,989 tons valued at £20,849. There has been a welcome improvement in price with the increased yield resulting in comparative prosperity to growers. No improvements in preparation by natives have been effected in a year when weather conditions were all against sun-drying. The local soap works purchased 617 tons. A factory for preparing edible oils is nearing completion. Kilns of the latest type are being installed in order to produce a high standard quality of copra. Fresh nuts will be bought from those growers within transportable distance. Smaller units may be established later to tap the Pangani and north Tanga zones. A proportion of fresh nuts is sold for food and, as monetary conditions improve, this demand will increase. There is also a trade in fresh nuts to Mombasa.

60. *Cotton*.—The quantity of seed-cotton produced by native growers in the Northern and Tanga provinces amounted to 3,497 tons and includes a carry-over of 112 tons from last season. This total compares with 1,266 tons for 1935. During the planting period rains were excellent everywhere and gave the plants a good start. Too wide a spacing last year was corrected with benefit to yields. The heavy prolonged rains and cool season marred the early start and gave cause for anxiety from American bollworm and other pests. This delayed the crop until October when dry sunny weather set in and brought on the crop in a remarkable way. The benefit to all districts of the good cotton harvest has been incalculable. The people of Handeni and Mbugwe in particular, after going for years with a tight belt, thanks to locusts and drought, have again become not only prosperous but well fed. The Handeni cotton kept up its good reputation and realized a premium of two cents a kilo of lint on the Bombay market compared with our other growths. A proportion of the area of native cotton lands is irrigable and each year some new development is undertaken to command fresh land wherever feasible. These are not extensive schemes but they are very valuable. The Pare district has had a most

successful season having harvested a crop of over a thousand tons of seed-cotton. The progress in cotton development is proceeding together with the development of rice, of which also a thousand tons surplus were exported. It is in this district that present irrigation projects have a big future. The utilization of the irrigable flats for food and cash crops is remarkably intensive when properly directed. A new ginnery has been erected in Korogwe in place of the one at Himo which was shut down and dismantled. There are four ginneries serving the area; two of these changed ownership between seasons during the year. The native cotton is bought by the respective ginneries in their areas at established markets for the fixed minimum promulgated price.

61. The young plantation cotton industry under the Rift Wall in Mbulu district was estimated at 2,500 acres. This area met unfavourable climatic conditions and had it not been that irrigation was available to flush the crop into a late flowering there would have been a heavy loss on the year's working. Three planters grew seven hundred acres of cotton near Arusha. A number of plantations are developing round Moshi and secured moderately good harvests. A general increase is to be looked for next year and sisal development may involve the interplanting of two thousand acres to cotton. In June the Entomologist made a tour through all of the cotton areas. The production of non-native seed-cotton amounted to 728 tons.

62. *Maize*.—During the year 2,589 tons of maize and maize flour were railed from the Moshi district down the Tanga line, whilst 701 tons were exported over the Kenya-Uganda line. This is less than last year and is mainly due to the unseasonable weather for grain crops. Besides this, many native growers went out of surplus production. The price has risen from Shs. 4/50 to Shs. 10/50 a bag of 100 kilos. A more stable price would be of great benefit to keep producers in the field since there is a big local market at hand.

63. *Citrus*.—A bumper crop has been harvested in the Muheza district resulting in a glut of fruit early in the season. Owing to the disappointing price on the Bombay market for last year's trial consignment no further tests have been made for other outside markets. Experimental work at the citrus station by the Agricultural Officer, Tanga, is referred to below. A local native authority rule in Muheza to protect the trees from annual grass fires has been rigorously applied. There are welcome signs of the planting industry taking active interest in small-scale citrus production.

64. *Other Products*.—Widespread small-scale plantings of ramie of the *nivea* variety were commenced this year. Apart from two estates which have been growing this crop for a few years, eighteen planters received material. It is too early to give an opinion except to say that given good attention the plant seems to flourish on good soils, but whether satisfactory yields can be maintained remains to be seen. Many samples of fibre and ribbons have been sent to interested people in London. At one time a profitable export of hand-stripped ribbons of bark and fibre was anticipated. The price quoted for this was uneconomic and there is no hope unless greater stripping speed either by hand or machinery can be effected. A decorticating machine has been purchased and tried out but we have not been able to obtain the performance claimed for it. So far the output is only a fraction of what it must be, and the material produced, though fairly clean, has not been well received in London in competition with "China grass." After-decortication treatments on the fibre have been carried out but this is wasted effort until the more important problems

can be solved. Degumming, etc., has been thoroughly worked upon elsewhere. A small supply of *B. utilis* cuttings is being multiplied up for distribution if required.

65. The export of equellor oil from one estate has increased to 2.63 tons valued at £958. Prices ranged from Shs. 7/6d. to Shs. 8/9d. a pound. Some trouble due to the presence of extraneous resinous matter was met with, which affected quality and was believed to be due to citric acid and water acting on the container. New types of filters have been installed. Towards the end of the year fruit became too ripe to give a first-quality oil and manufacture had to be stopped temporarily. The distillery for petit-grain and neroli oils has not yet been erected; the plant has been ordered and production should commence next year. An experiment was carried out by the Agricultural Officer, Tanga, to test the time trees would take to recover after stripping all the leaves. The stripped trees had fully recovered in eighteen months and could be plucked again.

66. A number of planters have begun experimental plantings of derris. It is thought to be a very suitable crop for the Usambaras and is being given a field trial on the Kwamkoro plantation of Amani. Other areas on the Tanga plains as well as upcountry are trying it out and those most suited to it should shortly be known. The Amani strain of *D. elliptica* has a high percentage of toxic properties and it is desired to confine extension to this material which will soon be available in quantity. The importation of inferior strains of derris is now controlled.

67. Besides derris and cinchona a third crop which promises well for the Usambaras is *Aleurites montana*. A few plants made available by Amani have been distributed. Extension depends upon the amount of seed produced by the few bearing trees.

68. The oil palm plantation above Muheza is being brought into production again. The price has returned to a remunerative level and the bulk of the output will be disposed of locally.

69. The tobacco factory in the Usambaras, manufacturing cigarettes and shag for the local market, has closed down. The production of a common tobacco by natives in the Lushoto and Handeni districts is diminishing. Almost everyone grows a little and there is only a limited demand for it among sisal labourers.

70. A small mill with an artificial dryer for making cassava flour has been installed at Bombwera. If the trial consignments which have been exported to Canada are successful the enterprise will extend. Cassava is one of the commonest crops in the coastal belt but the root as prepared and sold at the native markets is never clean and white. For the present the mill secures its supplies by purchasing fresh roots.

71. Plantings of oyster-nut, *Telfairea pedata*, are extending around Lushoto. So far less than a ton of nuts has been exported and the value is not yet known, though £100 a ton is quoted as a figure. There have been numerous enquiries from the Empire Exhibition but it is not certain as to whether it will be required for confectionery and dessert purposes, or whether it is to take its place among the oil seeds.

72. The export of onions by native growers on Kilimanjaro has increased this year to 390 tons valued at £3,423, the bulk of which is sent to Kenya. A smaller quantity is grown in the Arusha district.

73. The cultivation of potatoes by natives is general in the West Usambaras and in parts of the Pare mountains. A small proportion is exported from both areas to Tanga, amounting to 182 tons and 75 tons respectively, this year. There is no doubt that this quantity could be greatly increased. Distribution of fresh seed and the organization of grading, transporting and storage at the coast would be necessary. There is every reason to believe that there are suitable conditions upcountry for potato cultivation but the little that is grown in the Northern province is of a poor quality. The position is that we depend upon regular supplies from Kenya.

74. Very little interest is taken by natives in the production of beeswax and trade in it is insignificant. Certain areas have possibilities and, to encourage the preparation of this valuable product, selected individuals attended the course of instruction at Morogoro arranged by the Entomologist.

75. Land between Moshi and Kahe selected for cotton experimental work has been prepared for planting next rains. Varieties of seed from many sources will be given a trial and observations on them carried out.

76. Demonstration and experimental work for citrus is centred at the Muheza station. The season has been a good one and the young bearing trees are looking well. On parts of the station the soil is distinctly poor but has been improved greatly by the growth of *Calapagonium mucunoides* which is well established over all the terraces. It seems to be an ideal cover in that it dies down, leaving a thick leaf mulch, and regenerates itself and requires no attention. The change in colour taking place in the surface soil due to the humus thus added to it is noticeable. The Agricultural Officer, Tanga, remarks :—

“There are now four varieties of grapefruit on the plot: Marsh’s Seedless (two strains), Triumph (two strains), McCarthy, Duncan and Foster (in the nursery). Thus far observations indicate that the Triumph variety is undoubtedly the best for local conditions; it bears well and, what is of great importance with grapefruit, the quality of the fruit is excellent. Marsh’s Seedless bear only fairly well and the quality of the fruit is poor, it is possible that a new strain of this variety recently imported from South Africa will give better results. McCarthy and Duncan are satisfactory varieties. Foster has answered well in other parts of the tropics and might be suitable.

“All the imported varieties of orange with the exception of the Washington Navel and Navelencia bear fairly well but just as good if not better quality fruit in large quantities is obtained from local seedling trees. Two local seedlings have been selected for vegetative propagation. Washington Navel and Navelencia are very poor; the trees are stunted and yield very small crops of thick-skinned, juiceless and insipid oranges. It is now advised that the two best varieties of oranges are local selections vegetatively propagated and Valencia Late to extend the season. Unfortunately many growers think that any imported variety must of necessity be superior to a local variety.

“Budwood and some trees have been supplied to planters but supplies are still insufficient as considerable numbers of Seville orange seedlings were abandoned.

“The provision of water is the main difficulty in the nurseries which are dependent on the rainfall and what can be carried in cans. It may be said that apart from the very little water which can be carried by hand the trees are grown without irrigation.

“Two compost pits supplied manure and in addition dressings of sulphate of ammonia were given to all trees; the response was very noticeable.

“The nurseries worked by the local government school are in good order and now that the budding stage has been reached much more interest is being taken in the work; every assistance is being given to the schoolboys. Two ex-schoolboys have been in training for a year and they are now considered to be competent to run small nurseries by themselves. They have already been offered positions on estates.”

77. In the nursery it has been found that the Seville orange, which is so successful in other countries, promises not to be a suitable stock for our conditions. Trees on this stock show chlorosis and its use will be discontinued. Rough lemon has a tendency to outgrow the scion but in other respects is satisfactory. Pomelo stock for Marsh's Seedless grapefruit has been tried but the trees do not thrive. This preliminary work is invaluable and very necessary in order to give reliable advice and avoid costly mistakes being made.

78. Assistance has been given to the Sisal Experimental Station, where one thousand stocks were successfully budded with citrus varieties. It is intended that an adequate supply of budded trees shall be available as soon as possible for sale to sisal planters.

79. The Handeni seed farm which had been utilized as a multiplication centre for cassava planting material which was scarce has served that purpose and is being planted to a variety of food crops of improved selections. Trials were made of special types of cowpea and chick-pea, and these were a failure.

80. The Agricultural Officer, Lushoto, writes of the native authority farm as follows:—

“(a) The Lushoto native authority farm was the only holding managed during the year. Maize, edible canna, potatoes, beans and peas harvested during the year were distributed to natives.

“(b) *Coffee*.—The coffee on the terraces bore a small crop this year; the Jamaica Blue Mountain yielding about seventy kilos and the Kent's Hybrid about ten kilos. The coffee trees suffered from an attack of leaf-miner during the year. Shade trees in the form of a *Rauwolfia* sp. were planted on the terraces while *Trema guineensis* is springing up as a result of being spread by birds. Pigeon-peas and *Tephrosia* have also been established.

“(c) *Cattle byre*.—The cattle byre was completed during the year and five native cows purchased and installed. The manure is being trampled in the stalls and cleared out at infrequent intervals. The area under fodder grasses was extended and Uba cane obtained from Amani. The cattle are being grazed out for part of the day and grass is cut and fed to them in the byre.

“(d) *Fruit Trees*.—A further eighty-four fruit trees were added to those on the terraces in August and have taken well. Of the older fruit trees the peaches, nectarines and apples had a small crop last year.

“(e) The remaining slopes on the farm were planted up with contour hedges of *Coleus kilimandschari*.”

81. An extremely interesting settlement scheme for tuberculosis convalescents has been begun by the medical officer at Kibongoto. A number of small holdings are being laid out on mixed farming lines. The progress of this scheme will be followed with great interest as a valuable demonstration of farming land in a proper way.

PESTS, DISEASES AND VERMIN.

82. *Tsetse*.—Following upon a request from the Maize Growers' Association, the Department of Tsetse Research examined the fly problem in the Moshi district. The senior field officer made a preliminary examination in February. A field officer investigated more fully in June and later the position was examined by the Director himself.

83. The representation originated from a desire of the planters to improve their position by developing mixed farming in an area over which there is a lacework of fly. Native lands in the vicinity are also involved. After examination by the research officers it is considered that reclamation measures will have to be more radical than those visualized by the farmers. The area in question is one of the richest and best watered in the territory and therefore well worth developing.

84. *Locusts*.—Small swarms of red locusts entered the Handeni district and eventually passed over the Usambaras. No egg-laying occurred. Small scattered communities of the red locusts were present in the sub-Rift Wall area of Mbulu from the beginning of the year to the month of August when the few survivors took wing.

85. *Cotton*.—Conditions favoured cotton pests more this year than last. American and Spiny bollworms caused a lot of damage in all areas to early planted cotton. Jassid attacked cotton in the Luengera valley just after the rains. Later in the year stainers were numerous. Localized attacks of *Helopeltis* and aphid occurred.

86. *Coconuts*.—The coconut beetle continues to damage and kill coconut palms. The enforcement of the coconut regulations has been actively prosecuted. A large plantation north of Tanga requires a thorough cleaning-up.

87. *Sisal*.—There has been no report of any appreciable damage to sisal this year from weevil.

88. *Vermin*.—Drives against baboons and monkeys have been carried out in the Pare district and baiting by a game scout in the Luengera valley.

AGRICULTURAL SHOWS.

89. No agricultural shows were held during the year.

GENERAL.

90. The Director and Acting Director visited the circle on several occasions. Mr G. R. Sandford, Treasurer, attended meetings of the Sisal and Coffee Boards. Visitors to Moshi after the Amani Conference held in February included Mr H. B. Waters, Director of Agriculture, Kenya, and Mr J. D. Tothill, Director of Agriculture, Uganda. Mr C. Gillman, Chief Engineer, Tanganyika Railways, accompanied by Mr F. E. Kanthack from the Union of South Africa, spent a few days in the Northern province to investigate irrigation matters. Mr C. F. M. Swynnerton, Director of Tsetse Research, carried out a two weeks' survey of the fly problem. Mr S. Napier Bax, Senior Field Officer, and Captain Findlay, Field Officer of the Tsetse Department, visited Moshi. Also the following members of the East African Agricultural Research Station: Mr T. W. Kirkpatrick, Entomologist; Mr F. J. Nutman, Plant Physiologist, and Mr P. J. Greenway, Botanist. Dr E. Martin Case, Biochemist, Coffee Board, Kenya, made his headquarters at the Coffee Research Station. Mr W. V. Harris, Entomologist, made a tour of the cotton areas and Mr N. Field tours of inspection of all ginneries.

91. The year has been conspicuous for a return to more prosperous conditions; the turning point was reached and there is confidence as to the future. Development which has been so severely handicapped is going ahead and new interests are entering the field. The services which all agricultural officers are called upon to give in this circle are many and the essence of success, if energies are not to be dissipated, is close co-operation. Every effort has been made to maintain the close contact which is so desirable. Tribute must be paid to the staff for the wholehearted and energetic way in which they have tackled their work.

R. M. DAVIES,
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ANNUAL REVIEW OF THE NORTH-WESTERN CIRCLE.

FOR THE YEAR 1936.

1. *Staff*.—The office of Senior Agricultural Officer for the North-Western Circle has for the greater part of the year been filled by agricultural officers acting in the absence, firstly on leave and subsequently at Morogoro, of the Senior Agricultural Officer, Mr A. S. Richardson.

2. The districts of the Lake province have been well supplied with European officers of the department, each district having had a resident officer for at least part of 1936. The Ginnery Inspector visited all ginneries and gave helpful advice to the managements. He has also given considerable assistance in the circle office and in cotton market supervision, besides being responsible for the plans of the new permanent markets.

3. Two agricultural officers have been stationed in the Western province. These officers each cover two very large administrative districts in which production, although increasing, does not as yet warrant a more numerous staff. Two agricultural assistants help the Agricultural Officer, Tabora, in the management of two farms which, as forecasted in the 1935 review, have been started this year.

4. The departmental African instructor staff has been increased numerically during the year and, one hopes, strengthened by the training courses which it has been given. Native authority employees continue to render assistance to our staff during the months of greatest agricultural activity, besides serving in the markets. Attention has been given to the training of these men to fit them better for the tasks which they are expected to undertake.

GENERAL.

5. *Bukoba*.—The coffee industry paid for the record crops harvested in 1934 and 1935 by a crop which amounted in 1936 to only sixty per cent of that of 1935. This seriously affected the wealth of the Bahaya and bazaar trade in Bukoba and made itself felt so far away as in Sukumaland where there was but a small external demand for cattle. Our efforts in Bukoba are still aimed at obtaining better field sanitation; in this connection new local coffee rules have been passed. There are, however, a few Bahaya who are beginning to show interest in coffee production along more intensive lines, and these are receiving the full support of the officers in the district.

6. Rainfall was fairly satisfactory in the principal coffee areas, but deficient in the west, where the deficiency affected annual crops. No food shortages occurred. Cotton has been reintroduced after a number of years to that part of the district near the Uganda border for which this crop is suited.

7. An important feature of our work in Bukoba is the Nyakato Agricultural Training Centre, which may be said to have made progress during the year.

8. *Musoma (with North Mara)*.—This is one of the districts in which in recent years no officer of the department has been stationed. In June 1936, it was found possible to appoint an agricultural assistant to the district. Rainfall

for the year was above average and this accounted for ample food supplies in all districts, but was held partly responsible for an unduly high percentage of third quality cotton. A ginnery was re-erected in this district after removal from the Mwanza district.

9. *Sukumaland (Mwanza, Kwimba, Maswa and Shinyanga Districts).*—Throughout this large and populous area, which is a uniform climatic entity, rains began late and were prolonged, as in 1935, after what is considered the usual time. This meant that, although crops were planted late by the calendar, they received the normal amount of rain and harvest prospects were good. Exceptionally heavy rain, accompanied by high winds in the hinterland districts, resulted in some damage to food crops. On the whole 1936 must be described as a good crop year: while in some of the hinterland areas for the reasons given above grain supplies were on the short side, on the average they were above normal, particularly near the lake shore where the good food crop harvests released for sale and export a greater proportion than is customary of the groundnut and rice crops.

10. New high records have been established for cotton, rice and groundnuts. The disposal of these crops in the temporarily-erected markets put a severe strain on the Lake province marketing system. It is the opinion of the staff that although this strain nearly reached the breaking point in some instances, the system has been shown to contain no radical faults. It is hoped that with permanent and much more spacious markets which should be ready in 1937, and with a staff having the experience of the past season behind them, the marketing in the coming year will proceed with satisfaction to all parties.

11. All our work in Sukumaland is based on the results obtained from the experimental stations, Lubaga and Ukiriguru, and the rice sub-station at Mwabagole. These stations, without neglecting their experimental work, have developed during the year more towards becoming educational centres; classes, lectures and demonstrations being arranged at each, not only for the training of our own and the native authorities' African staffs, but for the agricultural education of the people. Two agricultural shows were held, one at Ukiriguru and one at Ibadakuli.

12. *Biharamulo (with Ngara).*—This district although administratively in the Lake province, agriculturally should be grouped with the Western province, which otherwise embraces all the north-western extension of the great "Brachystegia" or "miombo" forest. Our main effort in Biharamulo, where a comparatively large and expensive staff has been maintained, has been towards getting greater production of marketable produce, be it tobacco, groundnuts, rice, or, in Bugufi, coffee, together with a sufficiency of food crops. The Agricultural Officer writes that: "It would be rash to claim that any great or permanent advance has taken place—nevertheless, an advance definitely has been made." With rains which were on the whole good, no food shortages have occurred and increases are recorded in the sale of rice, groundnuts and coffee, while in the case of tobacco the 1935 level has been maintained and the position at the end of the year points to more being planted for the 1937 season.

13. *Western Province.*—After a series of unsuccessful attempts here to introduce cotton, this crop was abandoned except in two zones. During 1936 from 187 tons of seed distributed but only 85 tons of seed-cotton were obtained. During the coming year the attempt will be confined to the north-eastern corner of the province only.

14. *Kahama*.—Dry spells in March depressed the yields of maize and sorghums, but on the whole the season was a good one and no food shortages occurred. The efforts to encourage the growing of *Faya* rice have been continued.

15. The site for a settlement of peasant farmers on individual holdings has been chosen at Mwanhala and the construction of buildings started in June; the Ndomo native authority farm being closed down at the same time.

16. *Tabora*.—Rainfall was rather above normal and the season may be said to have been unusually favourable for crop production; new records for groundnut and rice production were established, but beeswax sales decreased. Before the season's crops were harvested local food shortages occurred in the district, due primarily to the sale during 1935 of too great a proportion of the reserves, including cassava flour.

17. Since June active steps have been taken to establish peasant farmers, and to this end a site for a demonstration farm and settlement has been chosen at Itumbi. It is hoped by these peasant holdings to revitalize the worn-out soils of Unyamwezi and by so doing to pave the way for increased production of such crops as groundnuts and rice, besides local food crops, and at the same time to put a definite end to any fresh inroads of the tsetse carrying "miombo" bush.

18. *Kigoma (with Kasulu)*.—The weather was favourable on the whole to crop production and there were abundant harvests throughout the district. While no startling progress can be recorded, the concentration of the bush people continues to give a filip to production and increases of exportable crops have been achieved. The agricultural survey has been completed, and observations continue to be made at sub-stations on new economic and food crops.

19. *Fipa*.—The Agricultural Officer, Kigoma, made a tour through this district which was last visited by a member of the department in 1932. The report of this tour shows that good food crops were harvested and that a ready sale for these exists in the Lupa goldfield areas. Rice is being more extensively grown on the lake littoral and is sold to merchants who are based on Kigoma, swelling the lake traffic receipts; while from the western parts of the district beeswax is collected. This is mainly exported overland to the railway at Tabora.

EXPERIMENTAL STATIONS, SEED AND DEMONSTRATION FARMS.

20. Separate experimental reports are being published for the two experimental stations in this circle: Lubaga in the Shinyanga district, and Ukiriguru in Mwanza. It is convenient, therefore, here to group the work of these stations with that of seed and demonstration farms. Funds for seed and demonstration farms are normally provided by native authorities with, in a few cases, some assistance from departmental sources, over and above supervision which in all cases is departmental. These seed and demonstration farms form a link in the chain which connects the experimental stations with the native cultivators.

21. *Nyakato (Bukoba)*.—At the agricultural training centre there are sited demonstration plots of coffee, bananas, maize, root and forage crops. These exist primarily in connection with the training centre but are used also for demonstration to visitors from the district. They invariably cause comment and amazement among native visitors who know the land to be most infertile. Indeed, these plots are growing on land of a type which by the natives themselves is used only once in seven years for the cultivation of certain annual crops such as Bambarra groundnuts (*Voandzeia*), "numbu" yams (*Coleus* sp.)

or cassava. The crops on our demonstration plots are grown by applications of compost once in two or three years. In co-operation with the Veterinary Department, and using both Ankole and Zebu cattle, experiments are being undertaken in stock-feeding using supplementary minerals, and in pasture improvement.

22. *Tarime (North Mara, Musoma)*.—A small seed multiplication centre and a coffee observation plot exist at this centre. The farm has been run by a native authority instructor with very little outside supervision for a number of years and he is to be congratulated on the keenness he still shows and for having carried on under these conditions in the excellent manner he has done. Maize, wheat, Canadian Wonder beans and peas are grown and the seed distributed.

23. *Ukiriguru (Mwanza)*.—This farm is an experimental station, seed farm, demonstration and education centre. So closely woven are each of these functions that, with the exception of ignoring the experimental results which have been published elsewhere, it is necessary to review the whole work. Cotton features largely in the planting programme of the farm. Almost all the cotton work is experimental, the multiplication of seed being allocated to the Nyamahona sub-station in Uzinza. The crops of secondmost importance are the many varieties of sorghum which form the principal food crop of the area. Among these varieties much selection work has been carried out and considerable quantities of the best selections are multiplied and the seed distributed. Although three local varieties of sorghum—Bukura mahemba, Bukura masemba and Nzanza—give the highest yields, native growers do not by any means always want these types but ask for what we and they know to be lower yielding varieties because of their better keeping qualities, quicker maturing character or because of a different flavour or colour. Groundnuts, both selections of the local varieties and the introduced Virginian Bunch type which is more early maturing, are grown and over three tons of seed were produced for distribution. Maize and pennisetum (Bullrush millet) are grown for seed distribution and take their places in some of the experiments. Tepary beans and “Fiwi” (*Dolichos lablab*) are grown for seed, and sunn hemp and velvet beans used for green manuring.

24. The farm at the present time is an outstanding demonstration of the benefits of early planting. It has been kept in good condition throughout the year and certain capital improvements, including new labour lines and the deepening of the dam to increase the dry season water supply, have been carried out.

25. In the Mwanza district there are in addition one acre demonstration plots at chiefs' headquarters at Urima, Bukumbi, Beda and Usukuma. These carry to outlying areas the demonstration work of Ukiriguru. The plots are managed on a four-course rotation of cotton, sorghum, groundnuts, millet or maize (manured) and are used to demonstrate manuring and early planting. This rotation includes two food and one cash crop and one leguminous crop which may be used for cash or food.

26. *Mwabagole (Mwanza)*.—This is an important sub-station of Ukiriguru at which rice experiments and demonstrations are conducted. The sub-station has been further enlarged during the present season. Seventy bags of rice of selected strains of the principal local rice varieties, Afaa, Majimaji and Sena, have been distributed from this station to the principal rice-growing areas of the district.

27. *Nyamahona (Mwanza)*.—There were two hundred and seventy acres under cultivation on this farm this year. More land has been opened up during the course of the year and buildings completed. All crops on the farm did well, with the exception of cotton.

28. *Mwasita and Shanwa (Maswa)*.—The Mwasita farm was mostly fallow during the year but twelve acres were planted with the early maturing *Feterita* sorghum for the production of seed, five tons being harvested for distribution. At Shanwa a small farm, upon which rotation of crops, manuring and anti-erosion work are demonstrated, is maintained.

29. *Lubaga (Shinyanga)*.—A separate report of the experimental side of this station has been submitted. Here, too, work is being carried out not only on the principal cash crops, cotton and groundnuts, but also to a very great extent on the food crops, sorghum, pennisetum and maize, and with the introduction of leguminous food crops for which there is a distinct demand in the district. After experiment, strains and varieties of proved superiority are multiplied on the farm and given to the individual native holders for trial under peasant conditions. Seeds from the farm are distributed on a *quid pro quo* basis, no free issues being made. Fifty tons of seed of various crops were grown for distribution during 1936.

30. The seed farm is run on lines which have been proved experimentally sound and therefore serves as a large-scale demonstration of manuring, rotation of crops and of anti-erosion measures. During the year additional windbreaks have been planted and water supplies have been further improved by the construction of a second tank dam and the commencement of a third and still larger one. The anti-erosion work has been reorganized so as to lead surplus surface water along gentle slopes to these reservoirs.

31. *Ntungamo Seed Farm (Biharamulo)*.—A coffee observation plot is maintained at this farm but the primary object here is the production of tobacco seed for distribution. The seed farm further affords a demonstration centre for contour trenching and anti-erosion measures and produces for distribution maize and other seeds. The Agricultural Officer reports that "natives and headmen of the district take no interest in the seed farm activities," so that it is regretted that, although it is entirely supported by native authority contributions, its value to them is very slight.

32. *Ndomo Seed Farm (Nzega, Kahama)*.—This farm was closed down during the year and its place taken by *Mwanhala* where a settlement scheme is projected. Work on this new site which is under the supervision of the Agricultural Officer, Tabora, and a resident agricultural assistant, commenced in June and at the end of the year buildings had been completed to serve the central farm and for the first two demonstration native holdings. At Itumbi, in the Tabora district, a second site has been selected and work as at *Mwanhala* had been completed by the end of the year.

33. *Kazima Prison Farm (Tabora)*.—On this farm demonstrations were carried out of anti-erosion measures, proper rice cultivation methods, the effect of green manuring, and of food crops of varieties suitable to local conditions. These demonstrations were of value to visiting chiefs and headmen who are reported as having been impressed by them.

34. *Marumba (Tabora)*.—At this centre an agricultural instructor is demonstrating the alternatives to shifting cultivation, namely, crop rotation, green manuring and the use of kraal manure on a four-acre plot worked by himself and his wife with hand hoes. Windbreaks of cassia and a sisal hedge

have been planted and a model house of the rondavel type with separate kitchen has been built of sun-dried bricks by the instructor. The work here, it is hoped, will appeal to such natives who have not the ambition to aspire to a twenty-acre holding (necessitating the use of ploughs) such as is being planned for demonstration at Itumbi nearby.

35. *Makeri (Kasulu, Kigoma)*.—A small farm is maintained by native authorities in the Makeri concentration for the purpose of multiplication of seed. Virginian Bunch groundnuts and sesame were grown for distribution, and as food crops, maize, the Nzanza variety of sorghum, and awned bullrush millet. Soya beans and tung oil are under observation at this centre and have given encouraging results.

NATIVE HOLDINGS.

LAKE PROVINCE.

36. *Ukiriguru (Mwanza)*.—Seven individual native holdings are maintained near to the experimental station. The two which have been closely observed since their start have had a fairly successful year and, besides a sufficiency of food, have received in the neighbourhood of forty-five shillings each for their cash crops, together with over twenty shillings each from the sale of milk. Their cattle (they are tethered) have been maintained in good condition on limited grazing, supplemented by feeding crop residues. A good quantity of farmyard manure has been made and applied to the grain crops. A cow which calved towards the end of May has been milk recorded and has given over two hundred gallons up to the end of the year; this during the dry and, therefore, difficult season for stock. The hours worked in the fields by the family (a man and his wife) amounted on the average to 1,478 hours for the year.

37. *Nyamahona (Mwanza)*.—The number of settlers has increased from thirty-two in 1934, and sixty-two at the end of 1935, to one hundred and fifty at the present time. These people have received no assistance in the development of their holdings, which are of twenty acres in fairly heavy bush, except the occasional loan of an axe or other small implement from the farm. They are being given time in which to settle down in their new holdings before being required to put into practice the improved methods which ultimately they will be expected to carry out. Owing to fly none of the settlers have been able yet to introduce cattle to their holdings.

38. *Buhungukira (Kwimba)*.—Sixty settlers were established here on twenty-acre holdings in 1934, but the result has not been satisfactory, probably due to lack of resident supervision and to the fact that these original settlers turned out to be cattle-owning persons who had been attracted by the open *mbuga* grazing which adjoins the settlement. Since they have never attempted to put any considerable part of their holdings under cultivation, there had arisen the danger that tsetse fly might re-enter the area. This year in order to prevent this calamity a further sixty families have been induced to settle in the vicinity from overcrowded parts of the district. These settlers each received a small semi-permanent house, but to none of them was given any individual holding, it being felt that, after spacing out their original free quarters so as to allow ten acres of cultivable land per household, they would best be allowed to organize the actual partition of the land among themselves. The agricultural assistant has assisted the district officer in work in connection with this settlement.

39. *Chibe (Shinyanga).*—This is an area originally settled by the Tsetse Research Department. During the year the Agricultural Officer, Shinyanga, laid out two contour lines in each holder's land to assist him to cultivate his fields correctly on the contour. A demonstration holding was started and on this ox cultivation is now being carried out in the hopes of encouraging other settlers to complete the clearing of their land and to acquire stock for draught purposes and for milk production.

40. *Lubaga and Ibadakuli (Shinyanga).*—The two demonstration holdings were maintained at Lubaga and on these, despite domestic troubles which affected both households, sufficiency of food was harvested and a cash return received from cotton and groundnuts which amounted to Shs. 94/- in the one case and Shs. 119/- in the other. A new demonstration holding was commenced at Ibadakuli, the holder besides reaping food crops sufficient for his year's requirements, received for his first season's work a cash return of Shs. 75/-.

WESTERN PROVINCE.

41. As forecasted in the 1935 review a start has been made with individual holding settlements in this province. Two sites of approximately fifteen hundred acres each have been chosen, one at Itumbi in Tabora and one at Mwanhala in the Nzega subdistrict of Kahama. The start of both these settlements has not been without considerable difficulties, but the scheme at Itumbi would now appear to be making progress. Two settlers and their wives were in occupation of their holdings before the end of the year and had started cultivation. At Mwanhala difficulties still continue and neither settlers nor adequate labour for the working of the native authority demonstration farm are at present forthcoming, with the result that it is not unlikely that a whole year will be lost.

AGRICULTURAL EDUCATION.

42. *Nyakato (Bukoba) Agricultural Training Centre.*—Mr C. Harvey, Agricultural Officer, has been in charge the whole year. The average number of pupils in attendance was forty-four compared with thirty-seven in 1935. The scope of the course has not been changed but experience of the past four years has led to some changes in detail.

43. Close touch is kept with the old boys through an old boys' association, and, as a number of them are now approaching the age at which they may be expected to settle down as married men on their own holdings, a scheme has been prepared in co-operation with the chiefs for making it easy for them to settle in groups as peasant farmers in various areas in the district. A few old boys were taken on as instructors in the department. The senior agricultural assistant who has worked with them in the district has expressed the opinion that, thanks to their training, they are superior to any young instructors he has previously dealt with.

44. Other activities of Nyakato are mentioned by the Agricultural Officer in his report: "Nyakato has been made use of as a meeting place for African instructors, members of growers' associations and teachers from the village schools. A short course in coffee culture for adults, extending over two months, was attended by seven young men." Two old boys' days and a parents' day were held at the school, which was visited by some of the chiefs.

45. *Ukiriguru Thursday Afternoon Classes.*—On Thursday afternoons an agricultural lecture is given at this farm to all employees and such neighbours as care to attend. The Agricultural Assistant, Mr W. C. Clarke, is responsible

for these classes and as attendance has averaged more than the daily number of labourers throughout the year it would appear that his work is appreciated. After a lecture, games are organized for those attending.

46. *Lubaga Adult School*.—Throughout the year evening classes were held twice weekly for those natives who wished to attend. Due to the success of these, and to meet a definite demand, an adult school, which it is intended shall help illiterate natives and their wives to become better agriculturists and better housewives, has been built and will be occupied early in the new year. This movement has the full support of the chiefs of the district.

WORK AT SCHOOL GARDENS.

47. Village and mission school gardens in Bukoba have been visited and demonstrations of coffee culture given.

48. The Agricultural Officer, Biharamulo, reports: "As a serious factor in agricultural education school gardens in this district are negligible because the children seldom attend for any extended period of instruction."

49. The Kakora school garden at Kwimba which formerly was run as a food producing concern has been greatly reduced in size and reorganized to demonstrate rotation of crops and the advantage of manure. A vegetable garden has been started near the newly-constructed dam.

50. At Ibadakuli school new crops which will improve the diet of the people are grown and the education in these is carried to the stage of introducing the use of them into the diet of the school. Nearly a ton of tomatoes was produced and consumed, and pigeon-pea is finding favour as a fresh pulse in the dry season.

51. At Maswa the planting programme devised in 1934 is still adhered to and may be considered an excellent one for a school of this size. An interesting result this season was a good yield from white soya beans, a crop which would fit in well with the rotations and which would be a valuable addition to the diet of the people, besides having commercial possibilities.

52. Seed and advice have been given to the organizers of mission schools in the Kigoma district. The robusta coffee given to Buyenzi White Fathers' mission in 1927 has grown into splendid trees and, although two-tailed mealy bug on the flower clusters considerably reduced the crop, yields satisfactorily.

53. The Agricultural Officer, Tabora, writes: "School gardens have been maintained at the native administration schools in Nzega and Kahama. Planting programmes and assistance in the matter of seed supplies were provided and personal visits paid when possible. The value of these school plots is very largely negated by the boys' absence (on holiday) during the first six weeks of the rainy season." This last sentence voices a complaint heard from many agricultural officers. By the holidays coming at this season the opportunity of demonstrating the advantages of early planting is missed and yields are frequently disappointing for no other reason than that the optimum planting date has been passed before the boys have returned to school.

TRAINING OF NATIVE AUTHORITY AND DEPARTMENTAL STAFFS.

54. Up till recently no centre has been available to which all pupil instructors, either native authority or departmental, could be sent for a period of training. Hence it has frequently happened in the past that when a new man had been engaged, after but a most preliminary discussion as to his duties,

he had been sent out for district work under the charge of a man but little better equipped than himself for the task ahead of him; from this system a few good instructors emerged but many more have fallen by the wayside.

55. Bukoba district is now able to choose from men trained at our own centre at Nyakato and as has been remarked before these men have already shown abilities which are appreciated. For the Mwanza district training is now carried out at Ukiriguru and in the same manner at Lubaga for the Shinyanga district staffs. Refresher courses have been held at both centres for our own and the native authority instructor and marketing organizations, and a few men from the staffs of other districts have been received at these centres. Two instructors from Kigoma attended the Entomologist's beeswax course at Morogoro.

PLOUGHING AND THE INTRODUCTION OF NEW IMPLEMENTS.

56. Ploughing is forging ahead slowly as an agricultural practice throughout Sukumaland, but particularly in Mwanza, Shinyanga and in the neighbouring district of Nzega. Over thirty ploughs, five cultivators, one ridger and one single-row cotton planter were purchased through the good offices of our officers on behalf of the natives.

57. A useful type of English-made hoe, several specimens of which were presented as prizes at the Shinyanga show, rapidly became so popular that before the end of the year it had been possible to arrange a local agency in the district.

ANTI-EROSION AND REAFFORESTATION.

58. In this circle the southern and western parts of which, except for a few highland areas, are covered by the seemingly endless brachystegia forest the question of erosion presents itself most formidably in Sukumaland, to which must be added parts of Kahama and Musoma. This area presents a picture of almost treeless slopes studded with numberless rocky kopjes, teeming populations both human and cattle and an apparently boundless ability of increased production. The native custom of ridged cultivation has been extended in the past outside those areas where it was indigenous, and has been made effective by alignment of the ridges along the contours. For a number of years all the farms over which we had some measure of control, our own experimental stations, native authority seed and demonstration farms, school and prison gardens, have served as centres of anti-erosion work, and in the Kwimba district particularly the Forest Department has made strenuous efforts at preventing wind erosion by the planting of windbreaks of *Cassia siamea*.

59. During the present year Mr A. E. Haarer, late Agricultural Lecturer, put a considerable area at Mwasita under broad-based contour banks by way of a demonstration and to prove the suitability of this type of anti-erosion work to the open grasslands. The results have been carefully watched, and such weaknesses as have been noticed will be corrected. Already from this demonstration one can learn that this system is extraordinarily good for a type of country where there is not a large proportion of cultivation, and where sheet erosion would otherwise occur.

60. Also during the present year Mr J. G. M. King, Agricultural Officer, dealt with a considerable area of land near Ibadakuli by planting contour belts of trees (*Cassia siamea*) bounded by hedges of manyara (*Euphorbia*) and, as this was an area where there was a considerable proportion of cultivation, he insisted upon the adoption of ridged cultivation within the area so planted.

The combination of ridge cultivation and contour tree plantations has proved an effective means of reducing surface erosion even during the first year of its existence.

61. Most officers of the Provincial Administration and of the departments most closely concerned have been given an opportunity to see these demonstrations, which have been visited by various chiefs. The result has been a demand that some such or similar demonstrations shall be repeated at every chief's headquarters. In Shinyanga this had been completed before the end of the year.

62. One cannot pass from this question of erosion without comments on four other activities which have a bearing. In the Maswa district the district officer during his term of office has achieved the great work of planting avenues along over one hundred and fifty miles of district roads. This may be looked upon as one hundred and fifty miles of windbreak, no small achievement. In the Kwimba district tree planting has been undertaken at the instigation of the district officer by every taxpayer at his homestead or at a place selected by him to provide himself in the future with fuel and firewood. Over fifty thousand groups of trees, besides the windbreaks and firewood plantations formerly planted, should do much to reduce wind erosion. In both these instances the forester has given valuable assistance and our own staff have been available to assist.

63. Secondly, the provision of more adequate water supplies is, in a great cattle-owning country, a considerable factor in preventing erosion. One can nominate the Tsetse Research Department as the originators on a large scale of such work as has been done in this line; but in the present year others have taken up this excellent work and dams have been built at the instigation of the district officers of Maswa and Kwimba, and of Chief Makwaia in Shinyanga.

64. Thirdly, the full support of our department must be accorded to the Veterinary Department in their schemes for rotational grazing, an innovation which has already proceeded far enough to show that when fully established it will allow the improvement of much pasture now overgrazed and still further reduce erosion.

65. Lastly, our "plant more crops campaign" of the past six years has had criticism levelled at it as a factor in increasing erosion, firstly by allowing an increase in the cattle (since every native with money is a potential cattle owner), and, secondly, by reducing the area under grazing; but both these alarms are, I believe, nothing more. Greater numbers of cattle than ever before are being consumed, solely due to the increased wealth which has resulted from the campaign, and once a taste for meat is inculcated in the stomachs of the people the demand will still further increase. For the second criticism it seems probable that crop residues provide better and more dry-season cattle food than does the untreated pasture from a like area.

AGRICULTURAL SHOWS.

66. For the third year in succession an agricultural show was held at Ukiriguru. At this show we were pleased to have the co-operation of the Veterinary, Forest and Health departments, the Nyegezi mission, Mwanza Chamber of Commerce and Messrs Gailey and Roberts. The demonstrations of all these participants greatly contributed to the success of the show which was visited by twenty thousand natives. A two-day show was held at Ibadakuli

in Shinyanga, being opened by the Provincial Commissioner, a former district officer of Shinyanga. The departmental district exhibit (which may be briefly summarized as having comprised (1) implements, (2) cotton picking and storing, (3) seed selection, (4) rotation of crops, (5) advantages of more than one cash crop, (6) the work of the Lubaga experimental station and (7) anti-erosion measures) was ably supported by trade exhibits and exhibits from the Tsetse Research, Veterinary, Medical and Forest departments, besides agricultural exhibits from Biharamulo, Maswa and Kwimba districts.

MARKET IMPROVEMENT AND CROP GRADING.

67. *Bukoba Coffee*.—During 1936 all coffee exported had to be graded either as G.A.Q., F.A.Q. or Triage, and the export of ungraded “inspected” coffee was no longer permitted under the Produce Export Ordinance 1935. The Agricultural Officer, Bukoba, reports: “The grading service has been implemented further this year by the inspection through African instructors (acting under native authority coffee rules) of coffee brought into various trading centres, and through the application of section 12 of the Coffee Industry (Registration and Improvement) Ordinance 1936,” and continues, “exporters report that over fifty per cent of the field offerings were up to F.A.Q. (and a small proportion to G.A.Q.) standard and were exported as such without further treatment. The margin between the district price of coffee and that for F.A.Q., f.o.b. Bukoba, was in consequence reduced from eighty-five cents to forty cents per frasila, the reduction representing a direct gain to the grower.”

TABLE OF INSPECTION.
Number of bags of 200 pounds.

		GRADED			Rejected	Total exported	Revenue collected
		G.A.Q.	F.A.Q.	Triage			
Arabica	...	2,842	23,144	Nil	3,464	25,986	Shs. 8,835/-
Robusta	...	375	46,956	440	11,831	47,771	17,748/60
Totals					15,295	73,757	Shs. 26,583/60
Rejections					17% of total offered		

68. *Bugufi Coffee*.—The parchment coffee crop from Bugufi was sold outright for £22 per ton delivered Bukoba to a firm of world-wide connections; the hulled “buni” was sold for fourteen cents per pound locally.

69. *Sukumaland Produce and Cotton*.—The original Sukumaland produce market system was in 1936 extended to include cotton, and so all agricultural produce was dealt with at the temporary markets erected under the ægis of the native authorities. The system has been described in previous reports and no alteration was needed for the inclusion of the cotton crop for which, however, minimum prices continued to be promulgated by the Director of Agriculture. The addition of fifteen thousand tons of produce was likely to cause some difficulties, but those experienced were mainly due to the huge bulk of the crop and it is hoped that these will be overcome when the permanent markets are completed. Everybody who has had anything to do with the markets agrees that the system is sound. Over thirty-four thousand tons of produce was sold

through the markets, at which well over £200,000 must have been paid to native producers. Details of the produce handled are given below:—

District	Groundnuts		Rice		Sesame		Gum		Seed-cotton	
Mwanza	...	1,654	...	6,614	...	85	...	—	...	6,303
Bukwimba	...	3,210	...	217	...	33	...	34	...	2,069
Maswa	...	2,300	...	5	...	12	...	2	...	4,362
Shinyanga	...	3,079	...	243	...	—	...	243	...	1,458
Musoma	...	667	...	521	...	418	...	—	...	808
Total	...	10,910	...	7,600	...	548	...	279	...	15,000
Total 1935	...	9,027	...	4,151	...	232	...	420	...	*
Increase	...	1,883	...	3,449	...	316	...	—141	...	15,000

*Not previously sold at these markets.

70. All cotton was not dealt with in this manner, because this crop could still be purchased by ginners at their own ginneries. The following quantities were purchased at these places by districts:—

Mwanza	...	...	...	4,859 tons	(5 ginneries).
Bukwimba	...	...	...	1,823 „	(3 ginneries).
Maswa	...	...	...	968 „	(1 ginnery).
Shinyanga	...	...	...	1,252 „	(2 ginneries).
Musoma	...	...	...	794 „	(1 ginnery).
Total	...	...	...	9,696 tons	(12 ginneries).

71. A considerable quantity of produce (rice particularly) is believed to have been sold to the shops in the trading centres after the close of the markets.

72. *The Biharamulo Tobacco Crop* was purchased by the native treasuries from individual growers who received an average of Shs. 8/19 for their crop as compared with Shs. 6/08 in 1935. After purchase the tobacco was regraded, conditioned and packed at a central factory and sold to East African firms.

73. A few produce markets, similar to those of Sukumaland, are worked in the Western province in those areas where groundnuts are produced.

CROP PRODUCTION.

74. *Coffee (Bukoba).*—The Bukoba coffee crop was smaller than it has been for the last three years, the reduction being the normal fluctuation following two heavy crops, but accentuated by the occurrence of a dry period during August-October 1936. Towards the end of the season there was a rise of price due in part to strong local demand when it became apparent that the Mombasa merchants' own estimates would not be realized: the crop exceeded by two hundred tons the departmental estimate.

Exports (in tons) for the years 1931, 1935 and 1936.

Arabica	...	1,738·3	...	3,408·7	...	2,347·2
Robusta	...	4,848·1	...	7,472·8	...	4,116·3
Total tons	...	6,586·4	...	10,881·5	...	6,463·5
Value	...	£133,261	...	£249,644	...	£160,330

75. The main coffee area of this circle is Bukoba ; there are, however, three other areas of small native production. These areas may each be considered marginal coffee country, where coffee can only be produced by the adoption of suitable cultural practices. One of these areas has for the time being successfully combated the difficulties. This is Bugufi, from where the crop is exported via Bukoba. The 1936 crop amounted to forty-three tons and appears in the figures given above. There are also : (a) North Mara, where insufficient is as yet produced for any export to be recorded, but where for some time to come the local mines should be able to consume the whole production, and (b) Kasulu/Kibondo, where the industry is nearly defunct—such as is harvested being consumed by the few Europeans in the district.

76. *Cotton*.—In north Bukoba a small area near the Uganda border appears eminently suited to cotton growing : the seasons are the same as in Uganda. Ten tons of seed were purchased from Uganda and distributed ; some plots have done very well but generally crickets and dry weather are responsible for but a small return. Marketing had not commenced at the end of the year but the crop estimate is for thirty tons of seed cotton.

77. The main producing area is Sukumaland, to which may be added parts of the Western province ; this latter is, however, rapidly ceasing to be a cotton area. In Sukumaland, as will be seen by the table given below, better use is being made of seed distributed than was formerly the case particularly in Mwanza and Shinyanga. Kwimba this year suffered a set-back due to late planting, and Musoma is only just beginning to grow cotton seriously.

In tons	1930/31 Seed distributed	1931 Seed- cotton	Ratio	1935/36 Seed distributed	1936 Seed- cotton	Ratio Cotton-seed : Seed Cotton
Musoma ...	597	3,678	6·1	490	1,602	3·3
Mwanza ...				1,205	11,162	9·2
Kwimba ...				802	3,891	4·8
Maswa ...				818	5,330	6·5
Salawe ...	102	77	·6	30	95	3·2
Shinyanga		Failure		326	2,711	8·3
Nzega ...				111	78	·7
Kahama ...				76	6	·08
Tabora ...						
Biharamulo	22	1		Cotton no longer grown		
	721	3,756		3,858	24,095	

In 1931, 1 ton of seed 5·2 tons, and in 1936 6·2 tons seed-cotton.

This season's crop establishes a new high record, and has taxed the storage capacity at the ginneries to the utmost. Ginning will not be completed before March 1937, but one can safely say that the yield will exceed the following final estimates : Musoma 2,400 bales, Mwanza 21,000 bales, Kwimba 6,000 bales, Maswa 8,800 bales, Shinyanga 5,300 bales, total 43,500 bales, and may reach 45,000 bales or more.

78. *Groundnuts* are an important crop in Sukumaland, second only in export value to cotton, and the principal cash crop over much of the Western province. Abundant food harvests and a rise in prices probably attracted more of this crop on to the markets than would otherwise have been the case.

The Lake province export approximated 10,000 tons, and that of the Western province exceeded 7,500 tons, both figures exceeding all previous records. The comparative figures for 1931 were under 2,500 and 1,000 tons respectively.

79. *Rice*.—Rice is extensively grown near the Lake Victoria and Lake Tanganyika shores, and to a less extent throughout Sukumaland and the Western province in small catchment dams. The crop is grown for sale, but in lean years is used for food; therefore, the export of the crop shows sharply the years of plenty. This season over 7,000 tons, of which nearly 5,000 were exported, were sold in the Lake province and nearly 4,000 tons were exported from the Western province as compared in 1931 with an export of 4,000 tons for the combined provinces.

80. *Sesame*.—Seven hundred tons of sesame were produced for sale in the Lake province, most of this production coming from the Musoma district. Another 100 tons was produced in the Western province where the Agricultural Officer, Tabora, reports: "Sesame has already died out in the Tabora district, where, before the popularity of groundnuts, it assumed a fair degree of importance." In 1931 the two provinces exported over 1,300 tons of sesame. It must be remembered that where transport is cheap groundnuts probably pay better than sesame.

81. *Tobacco*.—The Biharamulo crop exceeded 20 tons, having a value of approximately £1,000. Tobacco is not grown anywhere else as a commercial crop, but large areas in the "miombo" forest are suited to its cultivation.

82. *Beeswax*.—Tabora exported just over 200 tons of beeswax during 1936 as against 275 tons in 1931. The Agricultural Officer, Tabora, comments on this as follows: "There was an increase in the number of colonies and the year is regarded as having been a good one for flowers, so that one can only attribute the shortfall to a lack of exertion among natives in the matter of honey collection. This may be accounted for by the fact that the yields and prices of other crops were so high as to obviate the necessity of beeswax hunting."

83. *Gum*.—Production has fallen to under 300 tons. The Agricultural Officer, Shinyanga, writes of this, "various reasons have been advanced for the scarcity of gum, such as the plague of rats which invaded the low-lying acacia *mbugas* this season, and the natives' indolence to go out and gather it due to their momentary wealth from the cotton and groundnut crops; but the main reason of its failure is considered to be due to unfavourable physiological conditions."

84. *Food Crops*.—For the purpose of discussing the common food crops of the circle it is convenient to divide the whole into three parts: (1) the island highlands of the west, (2) Sukumaland and (3) the *Brachystegia* forest.

85. Bukoba is the most important of the island highlands and here the all-important food crop is the banana. Some of the principal coffee areas now do not produce their full requirements of this crop, but any shortages are easily met by movements from other parts of the district. Along the coast fish is caught and consumed in considerable quantities and the Bambarra groundnuts, which are extensively cultivated in the grasslands between the more fertile banana and coffee areas, are also an important addition to the diet which further includes cassava and a great deal of beer. When coffee prices are good, or the crops large, cattle are imported for slaughter from Sukuma but the local price of Sukuma cattle is high.

86. The other highland areas are Bugufi, Kasulu and Fipa. Except in the last named the banana continues to be an important article of diet, a small grain, eleusine, in Fipa, takes a very important position in the dietary. In all four of these highland areas the cereal diet is varied and fruit and beans plentiful and, in addition, milk and green food are obtainable almost throughout the year. Salt throughout this area is an article in great demand, which suggests that its use may fulfil a real need.

87. In Sukumaland one or other of the two grains, sorghum vulgare or pennisetum, forms the staple diet of the people. To these are added in season green maize and various vegetables, but in the long dry season there is a distinct shortage of fresh food, and throughout the year the proportion of protein in the diet appears to be deficient. Groundnuts are, of course, consumed to a certain extent but very few other legumes are grown; our experimental stations are at work attempting to find legumes which will yield well under the Sukumaland conditions and, furthermore, be attractive to the native palate.

88. Milk is easily obtained almost throughout Sukumaland and forms an important article of diet of at least the cattle-owning people. Meat is becoming more and more used as the wealth of the people increases. Near the lake shore there is always fish to be obtained, while as soon as the rain starts fish-traps are to be seen in all the river-beds.

89. When very many more dams have been constructed there should be an abundant supply of fresh fish and sufficient conserved water to allow the irrigation of small gardens for the cultivation of fruit and green vegetables throughout the season. This should make as great a difference to the diet of the Sukuma as did the introduction of fodder crops which permitted in England the obtaining of fresh meat and milk during the winter by our forefathers.

90. The rest of the circle which is neither Bukoba nor Sukumaland is practically entirely covered by *Brachystegia* forest and, although peopled by differing tribes, one finds a certain similarity of cropping throughout the area. Maize becomes equally as or more important than sorghum as the cereal crop. Sorghum may still cover the greater area, but one has to remember that this grain is extensively used for brewing purposes. Bullrush millet becomes a crop of quite minor importance except in particular areas, and generally the area under beans shows a very considerable increase. It would appear that the ordinary native bean (*Phaseolus vulgare*) is only successfully grown where two crops can be taken each season, due to the rapid deterioration caused by weevils of seed kept for any length of time. In the western part of the circle a bean crop has usually been harvested by Christmas and a second can be taken at the end of the long rains.

91. Over much of this area no milk or meat is available and very little fish finds its way into the inland districts, despite the very large trade in "dagaa" and other dried fish from Lake Tanganyika. Formerly, no doubt, game played an important part in the diet of the people but this can never have amounted to very much.

92. Throughout the circle natives are constantly exhorted to keep up the acreages under cassava and sweet-potatoes as an insurance against famine due to locusts or drought. At the present time the area under these crops is reported as satisfactory except in parts of the Tabora district.

PESTS AND DISEASES.

93. One can look on the year as one during which no serious damage has been caused by pests, vermin or diseases. Such of these as are always present, to mention a few: cotton stainers, striga, maize borer, "asali" disease of *Pennisetum*, *Stephanoderes*, *Antestia*, and coffee borer, have taken their usual toll but in quantities which call for no particular comment. Small bands of locusts appeared from time to time in various parts, particularly in the far west, but caused no serious alarm and practically no damage. Rats have perhaps been rather more than usually troublesome in the south-eastern parts of Sukumaland and the damage done by crickets to the cotton in Bukoba has already been remarked upon.

CONCLUSION.

94. It is perhaps needless to say that relations with the administration and with other departments have been cordial everywhere during the year. To the staff who have worked in the circle throughout the year great credit is due for what has been achieved and for the preparations which are well forward at the end of the year for still greater advances in all directions next season.

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ANNUAL REVIEW OF THE SOUTH-EASTERN CIRCLE.

FOR THE YEAR 1936.

1. *Staff*.—A gradual reduction of agricultural staff has taken place. At the beginning of the year staff comprised a senior agricultural officer, stationed at Lindi; an agricultural officer working the Lindi and Masasi districts; an agricultural assistant in Mikindani; an agricultural assistant and a district foreman in Songea; a district foreman in Tunduru, and a district foreman in Kilwa. By the end of the year staff was reduced to a senior agricultural officer in charge, one agricultural assistant doing field work in Lindi, Masasi and Mikindani districts; an agricultural assistant in Songea, and one district foreman in Kilwa.

GENERAL REMARKS ON WEATHER AND CROP PRODUCTION.

2. In a large area, extending from the Indian Ocean to Lake Nyasa, each district has naturally its own seasonal history. In the coastal area the rains were normal to excessive. The result has been bumper grain crops but a serious falling off in sesame, which always suffers in a very wet season. Cotton suffered, too, from excessive rains and flooding in Lindi and along the Rovuma. All crops were late in coming to maturity. In the hinterland the rainfall was normal and well distributed. Rather heavy rains in March increased the incidence of disease in Songea tobacco and much of the crop was thin and lacking in gum. The intermediate district of Tunduru had a normal year and very satisfactory progress was made with cotton growing. Cotton promises to become an important factor in the economy of Tunduru district.

3. Paucity of staff has necessarily set a limit to the scope of the department. It has not been possible to undertake any field work in Newala or Liwale; Kilwa, Tunduru, Mikindani and Masasi have had but intermittent attention; the two officers in Songea have had a heavy task in keeping pace with development in that district; while in Lindi itself, a district of high productivity, inhabited by a people whom it is difficult to influence, it has only been possible to reach a fraction of the population. Despite these difficulties the department has not been forced to abandon any of its activities.

4. Departmental effort has been mainly concerned with the organization and development of the cotton industry; improvement in the quality of sesame, the major native cash crop of the province; the fostering of other sources of cash income, such as groundnuts, cashew nuts, rice, beeswax, tobacco, coffee and wild rubber, to create a better and safer economic balance. In Songea much attention has been paid to building up a local tobacco industry and co-operative marketing. Finally, a very real effort has been made to graft all agricultural innovations on to existing systems of native farming with full and proper understanding of the place held by domestic food production in the economy of native life. The establishment of demonstration holdings has been the most successful means of bringing our aims to the notice of cultivators.

5. It is common practice to regard statistics of export as a gauge of production. This is far from being the case in a primitive society. Production is *primarily* for domestic consumption. Where the community is self-supporting

in most of its needs, export produce represents, not production, but surplus over essential wants. In this area where the vast bulk of the population are native cultivators supplying their own simple needs from the soil, the total value of exports represents not the income of the people but their surpluses or savings available for development and a higher standard of comfort and living. It is the gauge of their spending power and, as such, forms their contact with the outside economic world. Exports are, in fact, but a small fraction of production : the first aim of native production is a full larder.

6. In the memory of the people 1936 will be written a good year. Rain has been plentiful—plentiful to excess in some parts—and even if the main cash crop, sesame, and the second cash crop, cotton, suffered somewhat from the downpours, food has been abundant. In a peasant economy such as exists here food must always be the main preoccupation of the people, and fully four-fifths of their cultivation is devoted to its production. Hand in hand with a good food year the local demand for labour has improved. The rise in the value of sisal, with increased activity on estates, and the construction of the Lindi-Masasi road have added considerably to the cash income of the people. In practically all export produce the level of previous years has been well maintained : this, coupled with firmer prices, has created a happier tone among producers and merchants alike than has existed for many years.

INLAND AREA.

Songea, Liwale and Tunduru Districts.

7. *Songea District.*—The active participation of the department in the development of the hinterland has been practically confined to Songea district. In that district the policy has been to concentrate on the development of the three products which offered the best chance of economic disposal, that is, beeswax, tobacco and coffee, and to maintain adequate internal food supplies with sufficient reserves against all contingencies. The growing of cotton on Lake Nyasa shore as an extension to the Nyasaland cotton-growing areas has also received attention. The evacuation of other lower-priced native produce in bulk has not always been feasible in the past owing to the remoteness of Songea and the cost of transport. (In Lindi, Indian and Australian flour can be purchased more cheaply than flour from wheat grown in Songea.)

8. This year, owing to firmer prices and better and cheaper motor transport, a fair quantity of native produce has left Songea, the old wasteful head transport, so familiar a sight on the Lindi-Songea road but a few years back, has almost entirely disappeared. Fleets of lorries—Fords, Chevrolets and diesel-engined juggernauts—pass up and down the road. The hinterland is being opened up and the tendency is for more and more surplus produce to find its way to the coast and the outer world. In future the department will need to give attention to sesame, groundnuts and rice as additional sources of wealth. This year about eighty tons of sesame, over one hundred tons of rice and seven tons of groundnuts left the district by lorry. The amounts in themselves are not significant but they indicate that economic evacuation is now becoming possible.

9. *Coffee.*—Early in 1933 Government gave its blessing to native coffee growing and since then active assistance has been given to those splendid native farmers living in the Matengo hills, some of whom on their own initiative had started coffee growing years previous to this. The past four years have been devoted to correcting some of the errors of the early pioneer growers

and instilling a sense of responsibility and knowledge of sound cultural methods into all would-be new growers. At first all young trees were raised in tribal nurseries under departmental supervision—planting has been confined to the variety Kent's—but it has been found that as good results are obtained, with less friction, by allowing the more experienced growers to have their own nurseries. The standard of cultivation is kept at a high level. Planting sites are carefully selected and prepared a full season before planting out takes place. The majority are contour-ridged. The older trees are now coming into bearing. The 1936 crop amounted to about two and a half tons and this will be more than doubled in 1937. Some preliminary work has been done towards the organization of co-operative marketing of the coffee crop.

10. *Tobacco*.—The fire-cured tobacco industry has made rapid strides in recent years as the following figures show :—

1930	...	830 kilos.	1934	...	32,608 kilos.
1931	...	855 „	1935	...	106,045 „
1932	...	1,897 „	1936	...	120,766 „
1933	...	6,537 „			

The past year has been devoted to consolidating the position. No attempt was made to increase production by appealing to new growers; on the other hand increased attention was paid to cultural methods, curing and grading. The tendency since 1934 has been for production to outpace technical supervision and this year it has been necessary to impose a little healthy pruning to prevent deterioration in cultivation and the quality of tobacco produced. Production has been considerably above the 120 tons shown, as this figure reflects only the tobacco bought. An appreciable quantity of leaf was turned away as unfit for sale. In few crops can the value be enhanced or lowered to such an extent, according to the care given to intelligent handling, as tobacco. Tonnage without quality would spell the failure of the tobacco industry in Songea. The seeming severity of the grading and buying may cause the dropping out of some of the weaker growers but on the whole the effect will be salutary.

11. The raising of tobacco seedling, which in the early years was done solely in departmental nurseries, has gradually been taken over by individual growers. In 1936 the department directly supervised only three thousand yards of seed-bed, mainly as an insurance against loss in the case of growers new to the crop. No departmental nurseries have been prepared for 1937. The 1937 tobacco growers, some four thousand three hundred and thirty-four natives, have each been issued with sufficient seed to provide transplanting for at least half an acre. The seed was raised locally and carefully selected under departmental supervision at the two native authority farms at Luhira and Lipumba.

12. *Tobacco Marketing*.—From the beginning it has always been the aim eventually to dispose of the tobacco crop co-operatively. A great deal of preliminary work has been necessary through the years to bring this about. The Ngoni-Matengo Co-operative Union, Limited, came into being and applied for registration at the end of 1935. In March of this year Mr A. E. Twells, who, as a member of the department, has been so closely associated with the growth of the tobacco industry in Songea, left the department to take up the management of the union. All growers, whether members of the societies forming the union or not, sold their tobacco to the union. The union paid out Shs. 44,178/20 in cash to growers and, I understand, will also declare a bonus of seven cents a kilo on tobacco sold to it by members. In order to give greater

stability in this, its first year of working, the union has not acted strictly as an agency but has actually bought and sold tobacco. The result of the year's working should place the union's finances in a sound position.

13. *Cotton*.—An attempt was made to establish cotton growing on the shore of Lake Nyasa between Mbamba bay and Manda. Three African instructors from the coast were sent to advise the local people and distribute seed. A small start has been made; the season was unfavourable owing to late rain and cloudy weather, and yields were low. Nyasaland also experienced a partial crop failure. About six tons of cotton in all were harvested. This was sold to Nyasaland ginneries by arrangement. Although this beginning is small and not too successful the future still holds promise. Two demonstration holdings featuring cotton have been established to show how cotton can be worked in with the normal crops of the area. Despite the poor yields obtained this year, the demand for seed for next season is keen.

Tunduru and Liwale Districts.

14. There has been no permanent agricultural staff in these districts. Tunduru had the help of a district foreman in the early part of the cotton season and at the markets. The senior agricultural officer has advised the district officers on such problems as have arisen, and has given a little field assistance from time to time, but any real direct contact with producers has been through the administration. In Tunduru the start made with cotton in 1934 has gathered momentum and the establishment of a prosperous and stable cotton growing community seems likely.

				Local value
				Shs.
1934	...	1,718 kilos.	...	266/-
1935	...	17,444 „	...	2,551/-
1936	...	51,000 „	...	8,428/-

The marketing arrangements and prices for cotton have given general satisfaction and there is little doubt that the 1937 crop will approach the hundred-ton level. In Liwale some attention has been given to the collection of wild rubber, and a market has been found for all that has so far been produced.

INTERMEDIATE AREA.

15. *Newala and Masasi Districts*.—No staff has been available for Newala but the Agricultural Officer, Lindi, includes Masasi in his area. The growing of tobacco for fire curing was abandoned in Masasi. The conditions for fire-cured tobacco are not ideal and the quality of the leaf produced is poor. The district is capable of growing cotton, sesame and groundnuts in addition to normal food crops. In consequence more attention has been paid to these crops, particularly cotton and groundnuts, both of which are making fair progress in the district.

COASTAL AREA.

16. *Kilwa, Lindi and Mikindani Districts*.—In the coastal area all surplus produce is readily saleable. Particular attention was paid to cotton, sesame, groundnuts, rice and cashew nuts. Very many natives rely almost exclusively on sesame as a cash crop. The danger of this reliance on one crop is obvious, and with a view to taking a bond of fate, the policy has been to increase the proportion of cotton, groundnuts and rice. With regard to the sesame crop the main aim has been to improve the quality. It is pleasing to report progress in all directions. Cotton growing is becoming more stable and despite a very

wet season a substantial increase took place. Groundnuts are gaining ground annually as an export crop. The record export of last year was surpassed by some 350 tons. Rice also is now over the thousand-ton mark. A very big advance has been made in raising the standard of sesame. As the result of work at Mpapura a technique of seed selection has been developed and a pure-white strain of sesame was multiplied in bulk for general distribution. This seed is now in the hands of cultivators.

CROP PRODUCTION IN DETAIL.

17. A summary of the main items of export is given below :—

	1931		NATIVE PRODUCE		1935		1936	
	Tons	£	Tons	£	Tons	£	Tons	£
Sesame	2,841	28,998	...	4,381	47,071	...	3,394	43,701
Groundnuts	375	3,317	...	1,037	11,889	...	1,386	16,776
Grain	4,163	16,426	...	3,814	17,103	...	3,263*	12,863
Beeswax	77	6,119	...	270	23,880	...	103	10,325
Copra	491	3,848	...	644	4,917	...	871	8,389
Rice	1,212	9,599	...	393	3,569	...	1,009	6,858
Cotton	34	1,440	...	122	6,186	...	80*	3,534
Tobacco	120	2,965	...	192	7,143	...	163	6,675
Total	9,313	72,712	...	10,853	121,758	...	10,359	109,121
Sisal	6,253	69,472	...	10,654	154,030	...	8,763	197,221
Total	15,566	142,184	...	21,507	275,788	...	19,122	306,342

*The 1936 figures for grain and cotton do not reflect total output. There is a carry-over of grain to 1937 of over 1,000 tons, and cotton ginning is not yet complete. The cotton total will be about 175 tons of lint or 960 bales.

18. *Sisal*.—The feature of the year has been the improvement in the price of sisal. Sisal is now by far the most valuable export from the province. While there has been marked increase in value over last year, tonnage has fallen. This is accounted for by the fact that during the severe depression estates were unable to maintain their normal replanting programmes and that last year, when there was a revival in price, much overcutting took place in feverish dread of prices again slumping. Estates are now working at full pressure, carrying out normal replanting and making further extensions.

	Tons	Value
1931	6,253	£ 69,422
1935	10,654	154,030
1936	8,763	197,221

19. *Grain*.—With the exception of parts of Songea, where maize takes pride of place, and parts of the Makonde plateau, notably Newala and Rondo where cassava is the people's mainstay, sorghum (or *mtama*) is everywhere the most important crop. This province has always been noted for the quantity of grain produced. The German commander, Von Lettow-Vorbeck, based the strategy of his 1917 campaign on the sure knowledge that in the south there would be an abundance of food in July, August and September for his hard-pressed troops. Sorghum is grown primarily for food. There is, however, always

a general surplus even though local shortages occur, and this surplus, reflected in exports, forms one of the regular sources of purchasing power. The actual quantity of grain exported annually fluctuates between two and six thousand tons. Exports are not directly correlated with production. Price, freights and outside demand control the situation, but each year practically as much grain leaves the ports of the province as is exported from all the rest of the territory combined. This year there has been a bumper grain harvest but actual exports are so far only a little over 3,000 tons, the reason being that merchants have been holding grain in the hope of exporting to South Africa (unfortunately, our grain is now definitely excluded from South Africa owing to fear of foot-and-mouth disease and other infections) and for shipment up the east coast and to Arabia by the Muscat dhows, giving cheap freights, which usually arrive in November and early December, but which this year were late. Thus there is a large carry over of grain which will be exported early in 1937 and figure in next year's exports.

20. The figures of grain (other than rice) exports in recent years are :—

				Tons	Value £
1930	...	...	1,808	...	8,385
1931	...	...	4,163	...	16,426
1932	...	...	2,381	...	10,177
1933	...	...	1,185	...	4,481
1934	...	...	5,191	...	23,434
1935	...	...	3,514	...	17,103
1936	...	...	3,263	...	12,863

21. *Sesame*.—Sesame is grown primarily for sale and is the most important and valuable item of native produce exported. The growing of sesame is intimately associated with the growing of grain. In native farm economy sesame and grain are complementary factors. Sesame is grown both as a pure stand and as an inter-crop with sorghum or maize. The same rather heavy types of soil are suited to both crops but the seasonal conditions which favour heavy sorghum crops, continuous and late rain, result in poor sesame yields. Sesame, like cotton when once established, flourishes and gives heavy seed yields if the ripening weather is bright and warm. Thus it is that sesame fits so well into native farm practice; the native plants his sorghum and sesame, pure stands and mixed stands, year by year. He is "hedging" one crop against the other. If it is a good sorghum year, food will be plentiful and he will have some surplus grain for sale; true his return from sesame is rather low but not much additional labour was expended on its cultivation. If it is a bad year, the *mtama* makes poor growth, the sesame interplanted fills the gaps and more than likely a bumper sesame crop is reaped. He has little or no surplus grain to sell but the sesame is there to tide him over his cash difficulties.

22. The interplanting of sesame with sorghum is not universal, and an extension of the system over the whole province has been encouraged. But the most important feature of sesame work this season has been seed selection and multiplication. As a result of previous work at Mpapura, the department was in possession of a fair quantity of "Mpapura White" seed after the 1935 harvest. A simple technique for further selection of white or coloured strains had also been evolved. As white sesame commands a premium of anything up to two pounds a ton over mixed types it was planned to multiply the "Mpapura White" and have mass distribution of seed for 1937 planting. The

scheme was put into operation under departmental control but financed by the native treasuries interested. The multiplication was carried out at Mpapura. Unfortunately it has been a very bad sesame year and the yields have been poor everywhere. In Mikindani and in the vicinity of Mpapura the crop was practically a failure. Only at Mpapura itself was anything like a harvest obtained: but unfortunately there was not sufficient seed for the total substitution of "Mpapura White" for all other seed in 1937, as was the ambitious aim. However, seed for some twelve thousand cultivators was obtained and this is now being distributed. This seed, supplemented by further instruction in the field in the selection of good white strains, will bring about a distinct improvement in the quality of sesame exported. The technical work on selection continues. The colour question has been overcome and attention is now being paid to yield and oil content.

23. The exports of sesame in recent years are:—

			Tons		Value £
1930	...	...	2,520	...	27,068
1931	...	...	2,841	...	28,998
1932	...	...	4,002	...	42,817
1933	...	...	4,085	...	39,096
1934	...	...	3,928	...	32,974
1935	...	...	4,381	...	47,071
1936	...	...	3,394	...	43,701

The province normally produces between eighty and ninety per cent of the territory's sesame exports.

24. *Groundnuts*.—Until comparatively recently groundnuts were little grown in this area. Efforts have been made to popularize the crop, particularly on the red sandy soils of parts of Mikindani, Lindi and Masasi. The inter-planting of groundnuts in young cassava is a practice which appeals to native cultivators. For the past three years exports of groundnuts have been over one thousand tons and there is every prospect of further increase in the crop.

			Tons		Value £
1931	...	...	375	...	3,317
1932	...	...	294	...	3,144
1933	...	...	368	...	3,271
1934	...	...	1,046	...	8,364
1935	...	...	1,037	...	11,889
1936	...	...	1,386	...	16,776

25. *Beeswax*.—The annual export value of beeswax varies between £6,000 and £12,000. The province is one of the principal sources of beeswax in the territory. Little control can be exercised over output which depends entirely on whether the season has promoted activity among the bees or not. Wet years are usually bad years and the present year is no exception in this respect. Departmental effort has been directed toward the production of better and cleaner wax, and the keeping of hives in preference to search for wild hives in the bush.

			Tons		Value £
1931	...	...	77	...	6,119
1932	...	...	63	...	6,555
1933	...	...	135	...	12,147
1934	...	...	131	...	11,062
1935	...	...	270	...	23,880
1936	...	...	103	...	10,325

Beeswax comes largely from Songea and other inland districts, and a certain amount undoubtedly comes from across the Portuguese border and is exported through our ports.

26. *Copra*.—Production is in the hands of Arabs, Indians and a class of native it is very difficult to influence. Improvement in price has resulted in an increase in exports. The bulk of the export is from Kilwa. Total provincial exports are :—

			Tons		Value £
1931	...	...	491	...	3,848
1932	...	...	855	...	7,676
1933	...	...	347	...	3,198
1934	...	...	595	...	2,354
1935	...	...	644	...	4,917
1936	...	...	871	...	8,389

27. *Rice*.—Rice is a popular dual purpose crop, food and cash. The remarks in paragraph 19 under grain apply equally to rice. Exports represent surplus over food needs, although there is an increasing number of cultivators who grow rice purely for sale. The season has been favourable and a little over one thousand tons has been exported as against three hundred and ninety-three tons last year.

28. *Cotton*.—Sesame, groundnuts, grain, beeswax and rice all exceed cotton in export value and in present importance in native agriculture. Cotton has, however, received more attention than any other crop. Apart from actual attention to cultural methods in the field the whole question of seed supply requires annual organization, for growers cannot retain their own seed, as it is sold as seed-cotton and the lint must be separated at a ginnery before seed is again available for return to growers. Then again, the marketing of cotton is under close government control. The organization and supervision of markets is a heavy duty.

29. At every point where cotton is sold European supervision has been given and growers have been assured a fair deal. Markets have been as frequent and as close to growers as was feasible. A flat rate price operated over Lindi, Masasi and Mikindani, that is, the same price was paid at the ginneries as at buying posts further afield. Towards the end of the marketing season cotton seed was placed at all markets so that growers on selling their cotton could receive their seed well in advance without the inconvenience of making a long special journey for it later and during the rains. By removing disabilities and giving all possible assistance the crop is coming more into favour. On the cultural side demonstrations have been made showing the possibilities and advantages of working cotton into traditional cropping systems. These have been most successful. Cotton is now just beginning to find its rightful place as a native crop in this area.

30. It was undoubtedly a mistake from the beginning to attempt to bring cotton at one step into the very forefront of native farming. Signs are not lacking that by allowing natives to sum-up the merits and demerits of the crop for themselves and to act accordingly, giving them direct assistance in organization and seeking and demonstrating cultural methods whereby cotton is an addition to other native crops, the desired effect is being brought about. In Tunduru, where there has not been the same bad case history to overcome, cotton is becoming well-established as a native crop. Over the coastal area generally cotton is gradually coming into its own place in native farming as an

important supplementary cash crop. The coastal districts are unsuited to a one-crop cotton system; but when the cotton gamblers have dropped out and the ordinary native farmer, as a matter of course, has his patch of cotton in the maturing rice or maize, or following the grain crop before the land goes to cassava and fallow, or planted under whatever other system fits his own particular locality, field and needs, then there is every chance of a steady output reaching perhaps five thousand bales annually.

31. Seed was distributed as under :—

		1935			1936	
		Tons	People		Tons	People
Lindi ...	...	41	6,265	...	36	5,759
Mikindani ...	...	35	5,000	...	24	6,350
Masasi ...	...	14	2,363	...	6	1,255
Tunduru ...	...	3	350	...	5	352
Kilwa ...	...	93	5,907	...	62	6,423
Songea ...	...	—	—	...	3½	600
Totals ...	...	186	19,885	...	136½	20,739

Over the whole area the cotton crop was late in ripening, and yields were rather low. In the Rovuma area and parts of Lindi, flooding delayed planting or damaged early cotton.

32. *Marketing*.—The Lindi, Mikindani, Masasi and Tunduru crop was purchased by Messrs Mathuradas Kalidas and Company, Limited, at prices promulgated by Government. Buying was arranged at Mikindani and Mtua ginneries and at convenient buying post centres. A special effort was made to give European supervision at buying centres and this undoubtedly has created more confidence among growers. The Kilwa crop was purchased by the Kikanda Trading Company on the same basis. The price in the coastal districts and Masasi has varied between twenty-three and twenty-five cents per kilo for first quality throughout the season, with Tunduru seven cents lower. There has been general satisfaction both with prices and marketing arrangements. The only serious cause for complaint has been the bad state of the Lindi district roads, which on more than one occasion upset market arrangements as lorries and cars were either damaged, late or quite unable to reach their destination. It is no exaggeration to state the non-existence of reasonable district roads is a limiting factor in the development of Lindi district.

33. The sales of native-grown seed-cotton are given below. The value shown is the cash paid to growers not the export value :—

Districts	1935			1936	
	Lbs.	Shs.		Lbs.	Shs.
Lindi ...	202,118	17,140	...	385,000*	33,650
Mikindani ...	75,633	6,028	...	165,000*	15,000
Masasi ...	120,540	8,357	...	54,322	5,574
Tunduru ...	38,372	2,551	...	112,223	8,475
Kilwa ...	364,045	30,529	...	310,000*	27,900
Totals ...	800,708	64,605	...	1,026,545	90,599

*Estimates as final figures not yet available.

In addition to native-grown cotton, 148,035 pounds of seed-cotton was produced on non-native estates mainly interplanted in young sisal, as against 124,568 pounds last season.

34. *Tobacco*.—The exports of low grade native roll tobacco to the markets of the territory and Zanzibar has long been a minor source of income. The development of the fire-cured tobacco industry in Songea, which has been dealt with earlier in this report, has raised the value of tobacco exports to an appreciable figure. The value of tobacco exported now exceeds £6,000 per annum.

FOOD CROPS.

35. It has been stressed throughout this report that the production of food is the main preoccupation of native agriculture. A more detailed account of sources of food, and the very numerous crops which are cultivated by natives in the province for food, follows. A simple classification of food crops on the broad basis of supply of the three primary nutrients—the carbohydrates, crude protein and fat—is useful. If we add a special fourth class to include sources of supply of mineral matter, vitamins and such like essential factors in the vital processes or catalytic agents in human metabolism, not necessarily confining food to cultivated crops, most of the ground will be covered from the angle of nutrition. By subdividing this classification into major and minor crops from the agronomical viewpoint, a fairly complete picture of native farming in relation to food is presented.

36. Naturally nearly every crop is to some extent a source of each nutrient. There are proteins and vitamins in maize, and legumes are a source of carbohydrates besides being rich in nitrogen, but, for the purpose of classification, food with a wide nutritive ratio is put among the source of carbohydrates, and the narrow nutritive ratio foods are classed as source of crude protein, while green foods and relishes are put in the last class as being of protective value and providing other vital essentials.

Classification of Native Sources of Food.

(Southern Province.)

I. Carbohydrates.

(a) Major crops :

Sorghum
Rice
Maize
Eleusine
Cassava.

(b) Minor crops :

Sweet-potatoes
Wheat
Bullrush millet
Potatoes
Yams.

II. Crude Protein.

(a) Major crops :

Cowpeas
Pigeon-peas
Beans
Groundnuts.

(b) Minor crops :

Green gram
Bonavists
Bambarras
Lima beans
Velvet beans
Field peas.

III. Fats.

(a) Major crops :

Groundnuts
Sesame
Coconuts.

(b) Minor crops :

Bambarras
Sunflowers
Mikweme (Telfairia).

IV. Mineral matter and other vital factors.

(a) Cultivated fruits and greens : (b) Wild fruits and plants :

Green maize	<i>Ming'oko</i> (root)
Green beans	<i>Mawego</i> (root)
Green cowpeas	<i>Hangadi</i> (root)
Green sorghum	<i>Mchicha</i> (spinach)
Cassava tops	Tamarind (fruit)
Pumpkin flowers	<i>Kikundewu</i> (flower)
Rubber leaves	Palms (hearts)
Sweet-potato tops	and others.

Bananas

Mangoes

Pawpaws

Zambarao plum

Limes

Lemons

Oranges

Cashew apples

Cashew nuts

Tomatoes

Onions

Shallots

Garlic

Pumpkins

Loofahs

Cucumbers

Marrows

Watermelons

Ochra

Brinjals

Tumeric

Ginger

Chillies

Sugar-cane.

(c) Other sources :

LOCAL PRODUCTS :

Salt

Fish

Game

Honey

Ghur.

IMPORTED LUXURIES :

Tea

Sugar

Tin milk

Ghee.

Various fermented drinks made from fruit and grain.

37. The relative importance of the various crops shown above differs from district to district, and even from village to village ; nor are all crops to be found in one area. Wheat, potatoes and field peas are only grown in Songea. Eleusine is hardly grown on the coast, while coconuts and cashews are practically unknown inland. Taking a wide view of the province one can say that the people are well supplied with a staple farinaceous diet and there is but seldom need for concern over the quantity produced. Attention to better varieties and better field husbandry will, of course, lead to better yields, thus lessening labour or making it available for other production. There is a remote danger of grain failure through drought or locusts and for this reason increasing attention is being paid to the planting of root crops like cassava and sweet-potatoes.

38. The essential fact that a review of this nature brings out is that in the coastal area the physical well-being of the people is being retarded by a somewhat limited range in the sources of crude protein ; there is a qualitative rather than a quantitative deficiency ; there is also to a lesser extent a lack of

fat. Milk is quite unknown. Meat is so scarce that the eating of flesh is a luxury practically confined to ceremonial and social occasions, and dried fish has a phenomenally high value. A native fifty to hundred miles from the coast will pay the equivalent of a day's labour for a fish the size of a kipper which would not make a breakfast for a European.

39. The vegetarian or agricultural source of crude protein in quantity is mainly the leguminous crops supplemented in variety by numerous green foods. Of legumes there is a fair range, but in normal cultivation the ratio between legumes and grain is still too wide. Efforts are being directed to increase the proportion of legumes cultivation: this is a measure desirable not only on grounds of food value but as an important factor in better soil management. The legume crops have here to compensate to some extent for the lack of cattle both as source of food to the people and manure to the soil. The spread of the bonavist bean ("fiwi"), *Dolichos lablab*, from Mpapura station and other demonstration farms in the past few years is very noteworthy. In Mikindani, where the bonavist was practically unknown a few years ago, it now forms an important addition to native crops. The growing of pigeon-peas ("mbaazi") and velvet beans in demonstrations, planned mainly with the object of showing better land management, has also its effect on the food supply. These demonstrations have considerable effect in their immediate neighbourhood. Seed of the velvet bean, a rank grower with a heavy leaf fall, is now in some demand in Lindi, whereas only two years ago its cultivation was unknown.

40. It is a common fallacy to suppose that the native diet is very lacking in fresh fruit and vegetables. In the case of natives employed on estates or living in prisons, hospitals, labour camps or in townships, there is possibly some justification for this belief, but the native living his normal family life on his land has quite a wide variety of green food, fruit and vegetables. Most attempts to introduce European vegetables into native cultivation have failed where the object has been an addition to domestic food supply, as the labour involved is out of all proportion to the benefit. The native rightly regards growing European vegetables as specialized farming to cater for a luxury demand from Europeans and vegetables are to him a cash crop.

DEMONSTRATION FARMS.

41. Throughout the province, where there is agricultural staff, demonstration plots have been planned and established. The original demonstrations, started some years ago and described in earlier reports, have given a great deal of reliable data on local conditions. Originally these plots were designed not as self-contained holdings but rather to study and demonstrate the uses to which each type of soil could be put. But it has become increasingly apparent that the complete holding is a more suitable unit for demonstration work. The native can readily see what is of immediate value to him and is a quick imitator, but he cannot so readily adopt a theory to practice. Show him something which appeals and he will imitate it, very often down to the unessential detail. All new demonstrations have been planned as self-contained farms. Each is based on local custom and conditions of soil and vegetation; but in each a definite advance is incorporated.

42. A single illustration will suffice:—

Namwambi Demonstration.—This plot is situated on the southern side of the main Lindi-Masasi road, about six miles from Masasi Boma. It is on the red sandy loam soil supporting *miombo* bush typical of much of the district.

This soil is poor in organic matter and is usually cultivated for three to four years in succession and then fallowed for ten to fifteen years. The usual procedure is to plant a grain crop (maize and/or *mtama*) the first year, again the second year if there seems any prospect of the land carrying a second grain crop, and then going over to cassava and mixed pulses for a couple more years before fallowing. The object of this plot is to demonstrate systematic breaking of a proportion of new land each year (the system of clearing new land cannot be abandoned outright), rotation cropping introducing cotton after the grain crop and before the cassava, and the possibilities of prolonging the productivity of the land, by increasing the leguminous crop ratio and by turning crop residues into humus by adaptations of the Indore compost process. The rotation followed is as under :—

Commencing with virgin bush: *1st year*.—*Mtama*, maize, eleusine and pumpkins interplanted. This is normal custom; the eleusine goes on the ash and heavy timber and pumpkins are also planted on the ash heaps (“mabiwi”).

2nd year.—*Mtama* and sesame interplanted. This is also quite normal in native farming.

3rd year.—Cotton sown early in February. When the cotton is flowering, cassava interplanted in the cotton and established before the dry weather commences.

4th year.—The cassava continues to grow during the rains and is dug in the dry season.

5th year.—Early maize and early cowpeas interplanted (maize does well after cassava if the land is not exhausted). Bonavist beans follow late in the season after the maize.

6th year.—Cassava replanted and a little pigeon-pea mixed. Cassava dug at discretion.

7th year.—Pigeon-peas cut back, and velvet beans, a non-irritant variety of *Stizolobium*, the buffalo bean or “upupu,” broadcast over the land.

8th year.—Fallow.

43. The layout is simple. Three acres of land were cleared the first season and one acre of new land will be added each subsequent year. The first three acres correspond to the first three years of the rotation, i.e. :—

FIRST YEAR	Bush	Bush	Maize Mtama Eleusine Pumpkins	Mtama Sesame	Cotton Cassava
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SECOND YEAR	Bush	Maize Mtama Eleusine Pumpkins.	Mtama	Cotton	Cassava continued
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THIRD YEAR	Maize Mtama Eleusine Pumpkins	Mtama Sesame	Cotton Cassava	Cassava continued	Maize and Bonavist beans
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44. The above is the bare outline. Other innovations, such as compost making and the keeping of beehives and the growing of a few fruit trees round the house, are worked in as possible. Each holding has points of difference but each aims to be a focus point for departmental activity in its area. The native agricultural instructor or demonstrator lives on his holding. In this way he is not merely the mouthpiece of the European officer, but he becomes himself an experienced local farmer, able to appreciate and present to the impatient European the point of view of the people among whom he works.

CONCLUSION.

45. It is the common task of all departments of Government to raise the standard of living, happiness and general well-being of the population. The native can maintain a primitive sustenance level with but little outside contact, but for any material advance above this level he must rely solely on the value of export produce, be it sisal from an estate or cotton and rice from his own land, to provide a margin of purchasing power. It has been our aim to provide the knowledge, organization and encouragement whereby that margin can be increased. The responsibility for directing native effort has fallen most heavily upon district officers, and it has been the duty and pleasure of officers of the department to share to some extent both the labour and the responsibility.

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ANNUAL REPORT OF THE ENTOMOLOGIST, 1936.

STAFF.

1. I returned from vacation leave in February, since when I have been stationed at Morogoro. Tours have been made in the Lake, Central, Northern, Tanga and Eastern provinces. In addition members of the African staff visited the Western, Lake and Tanga provinces.

PUBLICATIONS.

2. The following papers have appeared during the year:—

"Termites and Cotton Growing." *Empire Cotton Growing Review*, VIII, No. 2.

"List of the Termites of Tanganyika Territory, with Descriptions of Two New Species." *Bull. Ent. Res.* 27, Part 3.

"Annotated List of Insects Injurious to Cotton in Tanganyika." *Bull. Ent. Res.* 27, Part 3.

"Notes on Two Injurious Psyllids and Their Control." *East Afr. Agric. Journ.* I, No. 6.

"The Sisal Weevil." *East Afr. Agric. Journ.* II, No. 2.

"Cotton Uprooting and Burning." T.T. Dept. of Agric. Ent. Leaf. No. 13.

"Cotton Stainers." T.T. Dept. of Agric. Ent. Circular No. 4.

"Collection and Preservation of Insects for Identification." T.T. Dept. of Agric. Ent. Circular No. 5.

"Pyrethrum for Tea Mosquito Bug." T.T. Dept. of Agric. Ent. Circular No. 6.

"The Grey Field Mouse." *East Afr. Agric. Journ.* II, No. 4.

EXTENSION WORK.

3. An exhibit was staged at the Shinyanga agricultural show. Laboratory demonstrations have been given to the senior boys of the local central school. A beeswax class was held at Morogoro (*see* paragraph 6 below) which was well attended by natives from many parts of the territory.

APICULTURE.

4. The export of beeswax from the territory during the year was 524 tons as compared with 531 tons in 1935. The Central and Western provinces maintained their output, but the Southern province dropped from 132 to 84 tons. This reduction was balanced by a large increase in the export through the port of Tanga, presumably the produce of the Tanga and Northern provinces, whence thirty-four tons were shipped as compared with less than a ton in previous years. The value of our beeswax has increased from an average of £87 2s. per ton in 1935 to £99 6s. in 1936, making a total value this year of £52,040. While this increase in value is due to a great extent to the improvement in world prices for beeswax, there are indications that the quality of the wax produced in a number of our areas is improving and so increasing the proportion of top grade wax in our export.

5. There has been a change in policy in our extension work in native bee-keeping, in that all work is now concentrated on wax. It has been decided with regret that the chances of success in keeping bees in the queen excluder type of hive developed by this department, are such that it cannot be encouraged with confidence among those tribes which are our main wax producers. The whole idea of a queen excluder depends on the ability of the maker of the hive to work with sufficient accuracy as to leave no extra bee spaces, and to produce a hive which will last more than one season without developing such bee entrances. Beyond encouraging the erection of hives of the local type, our work with the native is now directed entirely to maintaining the quality and increasing the production of beeswax.

6. Twenty-one natives have been trained at the laboratory in bee-keeping and wax preparation during the year. Of these, eighteen attended a course lasting one week held during September; the others stayed for a longer period. Eight districts were represented. This course was an experiment, in that much of the time was spent in trying to interest the men in the life history of the bee by means of lantern projections, cinema films and diagrams, in order to provide a background for the practical problems of wax preparation. It is to be repeated in 1937.

COTTON PESTS.

7. The incidence of cotton pests during the year followed a more or less normal course except in parts of the eastern zone where the abnormal prolongation of the rains resulted either in water-logging or in late planting. Cloud effect was noticeable in relation to Aphis attack. The opening up of new areas has increased the known distribution of a number of pests. *Helopeltis* must now be regarded as a major pest.

8. *Bollworms*.—The pink bollworm, *Platyedra gossypiella*, is still restricted to the eastern zone where it is ubiquitous. The eastward extension of the western zone into the Singida district necessitates increased supervision of the non-cotton area, which at present acts as a barrier to the westward spread of pink bollworm. The examination of bolls in the Morogoro district is summarized as follows:—

Cotton Boll Examination, Morogoro, 1936.

		Locules sound %		Locules showing bollworm damage %		Locules stained %		Platyedra per 100 locules
July	...	62	...	11	...	27	...	4
August	...	60	...	12	...	28	...	4
September	...	66	...	8	...	26	...	4
October	...	41	...	23	...	36	...	14

The figures for October 1935 were as follows: Sound 38 per cent, bollworm damage 8 per cent, staining 54 per cent, *Platyedra* 4 per one hundred locules. Comparison with the figures given in my report for 1934 shows that the reduction in numbers of pink bollworm has not been maintained, particularly in the earlier parts of the season when a clean first picking is so desirous. The incidence of pink bollworm in the Rufiji area was high; in one plot of rain grown cotton 76 larvæ were found in one hundred locules (i.e. twenty-five bolls) in October. The later-maturing flood-grown cotton was less highly infested.

9. Parasitism of pink bollworm has rarely been high in this territory. A seven per cent parasitism by a *Chelonus* sp. this season in the Rufiji is the highest yet recorded for the *Braconidae* here. Towards the end of the season in Morogoro there was found for the first time the parasitic mite *Pediculoides ventricosus* on pink bollworms present in bolls which had already opened. Of forty-five larvæ isolated in the laboratory only seventeen pupated and emerged as moths, the remainder (62 per cent) died as a result of *Pediculoides* attack.

10. Once again no double seeds or long cycle larvæ of *Platyedra* have been found after extensive search. The necessity for seed fumigation does not therefore arise, and control rests solely in the efficiency of the uprooting and burning measures.

11. *Stainers*.—Stainers of the genus *Dysdercus* were generally less numerous than usual, and reference to the table of boll examination (paragraph 8) will show that the resulting injury to cotton was also less. This reduction was mainly due to the failure of the usual August migration of *Dysdercus fasciatus* Sign. into the cotton fields. By the discovery in numbers of *Dysdercus orientalis* var. *pulchra* Schout. on cotton in the Usambara area, the number of species of *Dysdercus* injurious to cotton in this territory is brought to seven. The variety *nigriceps* Schout., of *D. nigrofasciatus* Stal., was found in the Moshi area. A search for *D. festivus* Gerst. was made at Mombo where it was recorded by Morstatt in 1913, but it was not found. Data obtained on the genus is being prepared for publication.

12. *Callidea* bug was again a pest in the Tabora area. The failure of the crop there is attributed solely to this pest, which carries the staining fungus in a similar manner to *Dysdercus* but appears in numbers earlier in the season. *Callidea bohemani* Stal. is the main species present in the eastern zone, while only *Callidea dregei* Gerst. var. is known in the western zone. Typical *C. dregei* specimens have only been obtained from the Lake Nyasa area, the Tabora variety having the distal ends of the femora darker coloured. While both species have been demonstrated as vectors of internal boll disease, *C. dregei* is the most injurious at present.

13. *Helopeltis* bug, *Helopeltis bergrothi* Reut., was present in increasing numbers in those areas of the eastern zone where cotton is grown at the foot of mountain masses, that is, the Usambara, Pare, Handeni and Morogoro districts. The fields where injury was serious, and in some instances the loss of crop was complete, were all on red soil derived from the granitic schists of the mountains, and climatic conditions early in the season were such that the fields were either water-logged after planting or were planted late. *Helopeltis* was present in some fields as soon as the plants had started to grow out of the cotyledonary stage. One of the disturbing features of *Helopeltis* attack is the rapidity with which serious symptoms arise with only a low insect population. *Helopeltis* as a nursery pest is discussed below (paragraph 20).

NATIVE CROPS.

14. Cassava is a staple native food over a large area of the territory and planting has spread as a result of its encouragement as a food plant immune to locust attack. In the Handeni area the growth of cassava has been hindered by a small stem and root boring caterpillar now known to be the immature form of *Opogona chlorophanes* Meyr. (Lyonetiidae). This pest has not been observed in the old established cassava growing areas. There appeared to be

definite varietal susceptibility to the borer. A scale, *Lepidosaphes (Coccoomytilis) dispar* Vayss, is distributed over a wide area in the south and is capable of doing much damage under suitable conditions. It is, as a rule, heavily parasitized by the coccinellid beetle, *Chilocorus distigma* Klug. The elegant grasshopper, *Zonocerus elegans* Thnbg., was abundant this year on the coast, and did a fair amount of damage to cassava as well as garden plants in general.

15. Rice was attacked by an orange coloured Cercopid bug, *Locris neumanni* Jac., on the shores of Lake Victoria. It was most evident in the seed beds, where the young shoots turned yellow after the bugs had punctured them. On the coast a bug, *Oliarus* sp., belonging to the family Cixiidae was found to produce yellowing of the foliage by feeding on the roots of the plants.

16. Vegetables are being grown in increasing quantities by natives as well as by European farmers. Onions are liable to attack by caterpillars, including *Cirphis loreyi* (Noctuidæ), and by three species of thrips: *Thrips tabaci* Lind., *Aelothrips varicornis* Bagn. and *Dolicothrips karni* Faure. Cabbages are injured at all stages of growth by the Diamond Back Moth, *Plutella cruciferarum* Zell., particularly during the dry season when vegetables command a higher price. Turnips are seriously affected by the sawfly, *Athalia sjostedti* Knw. Pyrethrum extract sprays are efficient against these pests, but are excluded by their cost from use by most native cultivators. The development of insecticidal plants which may be grown by the native is being studied.

17. The storage of food crops is receiving attention, particularly with a view to finding suitable non-poisonous substances for mixing with the more susceptible varieties of sorghum and legumes to repel weevil attack. Where fumigation is possible or even where clean storage accommodation can be provided, the problem is a minor one, and much might be achieved if grain dealers, village storekeepers and the natives themselves could be persuaded of the error of their ways. For example, cowpeas purchased in the bazaar eighteen months after harvest were found to have lost forty-one per cent by weight, whereas similar cowpeas stored on the experimental station without special treatment lost only eight per cent. Large and small scale trials of a number of treatments of practical interest to the individual native are proceeding. The large scale trial with a susceptible sorghum is proceeding slowly owing to the slow rate of reinfestation following efficient fumigation and the use of clean whole sacks.

PLANTATION CROPS.

18. There has been a welcome reduction in numbers of the sisal weevil during the year. A scale, *Aspidiotus* (? *destructor* Newst.) has occurred in isolated cases. Otherwise this crop continues to hold its enviable position as regards freedom from injurious insects.

19. Coffee in Bukoba was attacked more than usual by the leaf-eating caterpillar, *Metadrepana marantica* Tams, and the cherry butterfly, *Deudorix lorisona* Hew., was in evidence in Bugufi. *Monohammus centralis* Duv., a Lamiid beetle, was reported for the first time on coffee in Bukoba, where a new leaf-miner, *Acrocercops chalybophares* Meyr., was also bred out. The flute hole borer, *Dirphya usambica* Klbe., was received from Kilimanjaro where it had been bred out from the wild tree *Rytigynia schulmani*.

20. *Helopeltis bergrothi* Reut. to which reference has already been made in paragraph 13 above was reported on tea from further parts of the Southern Highlands. Coincident with its increase as a cotton pest, it has been found

to be a nursery pest of great possibilities, particularly in the case of Avocado and a number of non-citrus fruits, which continue to be injured after planting out. Kapok, ornamental Solanums, Acalypha and Datura are also attacked. Control measures with pyrethrum dust have given very satisfactory results. A mixture of one part of fresh pyrethrum and two parts of fine lime, mixed just prior to use, made an economical dust for liberal application with an ordinary rotary blower. Two applications at an interval of eighteen days were necessary.

TERMITES.

21. Work on termites has progressed along two lines, one the collection and identification of specimens in continuation of the work already done last tour and during my leave, the other the detailed study of species of economic importance and methods for their control.

22. Paradichlorobenzene and two proprietary soil fumigants have given good results in the treatment of trees and ornamental shrubs suffering from termite attack below ground level. However much it may be argued that termite attack of growing trees is merely symptomatic of more fundamental trouble, practical experience has shown that such basic causes are in many cases temporary, since the control of the termites by soil fumigants, coupled with the stimulus of manuring and watering resulted in complete cures. Similarly, the use of a little soil fumigant when planting out trees and shrubs at any time, except under the most favourable rainy conditions, is of considerable value. The smaller soil dwelling species, such as *Microtermes redenianus* Sjost. and *Allodoterme morogorensis* Harris, are mainly concerned in this type of attack.

23. Injury to older trees, too often the result of incredible carelessness in pruning, is occasioned by a number of species, including *Schedorhinotermes lamanianus* Sjost., *Microcerotermes parvus* Hav. and *Coptotermes amani* Sjost. Boring beetles and caterpillars also permit of the entrance of termites. *S. lamanianus* is widely distributed in forest areas and appears to have a definitely limited range of host trees. Among cultivated trees the Avocado and Jacaranda are very susceptible. Nests are to be found in the trunks and branches of older trees, where wounds have permitted the ingress of the termites, and successful treatment involves the protection of these hollows from rain to prevent further rotting after the termites have been killed by fumigants.

24. An addition to the species already listed as attacking cotton is a *Hamitermes* sp. found in the Pare district girdling stems just above ground level, rather after the manner of a longicorn beetle. *Hodotermes mossambicus* Hagen plays its part in assisting soil erosion in the grazing areas of the Western and Lake provinces by attacking the grass clumps. *Allodoterme morogorensis* and *Eutermes* sp. are injurious to lawns during dry periods, but can be restrained by light dustings of paris green.

LOCUSTS.

25. *The Red Locust*—*Nomadacris septemfasciata* R. & F.—The locust situation at the end of 1935 was most favourable. There had been no pre-breeding migration over our southern border, and the few remaining swarms in the territory were concentrated in the Usambara mountains, in Ufipa, and in the country south and west of Lake Victoria. A small swarm also remained

on the shores of Lake Manyara below the rift wall in the Mbulu district. During January there was some movement of mature swarms both ways over our north-western border. Egg-laying commenced the same month and took place in the Mwanza, Biharamulo and Bukoba districts in the north-west, in Kahama, Tabora and Ufipa in the west; and at Lake Manyara in the north. Hopper destruction progressed with success in all inhabited areas. In many localities, however, emergence was poor and the egg parasite, *Scelio howardi*, was reported over a much wider area than heretofore. There was a second emergence about three weeks after the first in the Lake Victoria area. The surviving hoppers moulted for the last time during May, and small flying swarms were reported in the west and north-west.

26. At the end of June there commenced the unexpected movement across the southern border from the coast to Lake Nyasa of a number of strongly flying swarms which swept northward during July and August though the country east of 35 degrees, some reaching Kenya. There was a concentration for a while in the mountain masses which border the central plateau and then no more has been heard of them. No further invasions have taken place from the south. During December there were only three reports of swarms on the Uganda and Ruanda-Urundi borders.

27. Should the present locust cycle be drawing to a close, as might be hoped from the present state of things, it will have followed closely on the lines of that last great cycle which ended, as far as Tanganyika is concerned, in 1904.

28. ADDITIONS TO THE LIST OF INJURIOUS INSECTS.

<i>Callidea dregei</i> Germ. (Hemiptera, Pentatomidæ)	...	Cotton.
<i>Dysdercus orientalis</i> , var. <i>pulchra</i> Schout. (Hemiptera, Pyrrhocoridae)		"
<i>Dysdercus nigrofasciatus</i> , var. <i>nigriceps</i> Schout. (Hemiptera, Pyrrhocoridae)		"
<i>Hamitermes</i> sp. (Isoptera, Termitidæ)		"
<i>Locris neumanni</i> Jac. (Hemiptera, Cercopidæ)		Rice.
<i>Oliarus</i> sp. (Hemiptera, Cixiidæ)		"
<i>Apion ugandanum</i> Wagn. (Coleoptera, Curculionidæ)	...	Earth-pea.
<i>Melanagromyza phaseoli</i> Cog. (Diptera, Agromyzidæ)	...	Phaseolus beans.
<i>Opogona chlorophanes</i> Meyr. (Lepidoptera, Lyonetiidæ)	...	Cassava.
<i>Lepidosaphes (Cocomytilis) dispar</i> , Vayss. (Hemiptera, Coccidæ)		"
<i>Diostrombus abdominalis</i> Dist. (Hemiptera, Derbidae)	...	Coconut.
<i>Cirphis loreyi</i> Dup. (Lepidoptera, Noctuidæ)	...	Onion.
<i>Thrips tabaci</i> Lind. (Thysanoptera, Thripidae)	...	"
<i>Lecanium viride</i> Green. (Hemiptera, Coccidæ)	...	Peppermint.
<i>Monanthia</i> sp. (nr. <i>globulifera</i>). (Hemiptera, Tingitidæ)	...	"
<i>Lonchaea mochii</i> Bezzi. (Diptera, Lonchæidæ)	...	Iris.
<i>Niphadolepsis bipunctata</i> Herring. (Lepidoptera, Gracilariidæ)		Coffee.
<i>Monohammus centralis</i> Duv. (Coleoptera, Lamiidæ)	...	"
<i>Apate terebrans</i> Pall. (Coleoptera, Bostrychidæ)	...	<i>Poinciana regia</i> .
<i>Peaesiorrhina trivittata</i> Schaum. (Coleoptera, Cetoniidæ)	...	Guava.

ACKNOWLEDGMENTS.

29. I have to acknowledge the assistance received during the year from Sir Guy A. K. Marshall and the staff of the Imperial Institute of Entomology (identification of insects), Dr Finnegan, British Museum (identification of Arachnida), and Mr P. J. Greenway, Amani (identification of plants). Donations of insects to the collection from Mr W. H. Potts, Tsetse Department, and Mr T. Kirkpatrick, Amani, are appreciated.

W. VICTOR HARRIS,
Entomologist

ANNUAL REPORT ON PLANT PATHOLOGY, 1936.

ROUTINE.

I have been stationed throughout the year at the Coffee Research and Experimental Station, Lyamungu, Moshi, and shall be on duty until March 1937, when I proceed on vacation leave. I attended the conference at Amani from the 24th to 26th February. Six *safaris* have been undertaken, chiefly in the Tanga, Northern and Iringa provinces.

The greater part of the work of the laboratory has dealt with coffee diseases which will be referred to in the report of the Coffee Research Station. During my period of office as Acting Chief Scientific Officer in charge of the station from the 29th April to 4th December much time was taken up by general administrative and routine work.

During the past year the number of enquiries on pathological matters has decreased. This is believed to be accounted for by the increasing experience among agricultural officers of local disease problems and greater use of information already given in leaflets and other publications. The pathological laboratory has now been established for ten years. During that period much time has been devoted to advisory work; it is anticipated that more time will be available in future for deeper investigation of particular problems.

PUBLICATIONS.

An article on "A Root Disease of Cacao associated with *Ustilina zonata* Lév." was published in the *East African Agricultural Journal* 1, 4, in January. "A Second List of Fungi and Plant Diseases in Tanganyika Territory" was published in the *Kew Bulletin of Miscellaneous Information*, No. 3 of 1936. "A Revised List of Plant Diseases in Tanganyika Territory" has been submitted for publication in the *East African Agricultural Journal* early in the coming year. This list combines the earlier lists and includes a few additional records.

DISEASES OF CROPS, OTHER THAN COFFEE: SISAL.

Stump rot, previously recorded from two sisal plantations on the Central railway, was observed in June on three plantations in the Tanga district. The previous experience that only plants whose leaves had been cut during the rains were liable to be affected did not apply in all of the present cases. In some plants the rot starts at the base of the plant below soil level. There is still no evidence to indicate that the disease is parasitic, and the conclusion already arrived at—that it is primarily caused by deficiency of some soil nutrient—is unaltered. The manurial experiment started on one of the Central railway plantations yielded no results, as areas suitable for experiment were limited and there proved to be a decrease of the disease over all these areas due to natural causes. As early as possible an experiment will be laid down on one of the affected plantations in the Tanga district.

A form of wilting occurred on several plantations during the dry spell in June following the heavy rains. The symptoms resemble those found in sisal growing under heavy shade: pale yellow-green leaves lacking in strength and falling over. It was particularly common on large ant-hills, though not on all. It was expected that the majority of the plants would recover.

CEREALS.

Maize.—Leaf Blight (*Helminthosporium turcicum* Pass.) was recorded with certainty for the first time from the Iringa district in May. Head Smut (*Sorosporium reilianum*) has been recorded from Kigoma district where it was observed at an elevation of four thousand five hundred feet. It had not previously been seen below five thousand feet.

Sorghum.—Sulphur treatment of seed to prevent Grain and Loose Smuts has been continued with success in the sorghum-growing districts. There is evidence that its use in successive years reduces the incidence of these diseases to negligible proportions.

Bulrush Millet.—Experiments on seed treatment against Downy Mildew were carried out at Ukiriguru by the agricultural officer. Decisive results have not been obtained, but the experiments will be repeated in the coming year.

Wheat.—Loose Smut (*Ustilago tritici* (Pers.) Jens.) was recorded for the first time from Arusha. Seven varieties of wheat with resistance to Leaf or Brown Rust (*Puccinia triticina*) were received from the United States of America and will be tried out in the Iringa district.

Rye.—Six varieties of rye, resistant to Brown Rust (*P. secalina*), were received from the United States of America and are being tried at Iheme.

MISCELLANEOUS CROPS.

Tobacco.—Wildfire, Alternaria Leaf-spot and Blackfire were recorded from Songea.

Tea.—Suspected Brown Root Disease (*Fomes lamaoensis*) has been observed at Mufindi. In the absence of fructifications the identity of the fungus is not quite certain. An infection experiment is being attempted.

Loquat.—This plant is an additional record to the list of hosts of Armillaria Root Rot in the territory.

Avocado.—The suggestion was made that the disease referred to in the Annual Report for 1934, page 93, might be caused by capsid bugs, for example, Helopeltis. This has been examined by the Entomologist, Morogoro, and found to be correct.

Peas.—The perithecial stage of *Erysiphe polygoni* has been observed in the Moshi and Iringa districts.

G. B. WALLACE,
Plant Pathologist

LIST OF EUROPEAN STAFF AS ON 31st DECEMBER 1936.

DIRECTOR: E. Harrison, C.M.G., Head Office, Morogoro.

DEPUTY DIRECTOR: A. J. Wakefield, on leave.

SENIOR AGRICULTURAL OFFICERS: A. S. Richardson, Head Office, Morogoro;
C. K. Latham, Lindi; R. M. Davies, Moshi.

AGRICULTURAL LECTURER: On leave.

CHIEF SCIENTIFIC OFFICER: S. M. Gilbert, Coffee Research and Experimental
Station, Lyamungu, Moshi.

PLANT PATHOLOGIST: G. B. Wallace, Coffee Research and Experimental Station,
Lyamungu, Moshi.

ENTOMOLOGISTS: W. V. Harris, Morogoro; F. B. Notley, Coffee Research and
Experimental Station, Lyamungu, Moshi.

CHEMIST: H. B. Stent, on leave.

AGRICULTURAL OFFICERS: J. V. R. Brown, on leave; C. B. Garnett, Dar es Salaam;
D. Sturdy, Mwanza; C. Harvey, Bukoba; A. S. Stenhouse, Biharamulo;
H. Marsland, Mpanganya, Rufiji; C. J. McGregor, Iringa; A. H. Savile,
Mwanza; N. V. Rounce, Morogoro; T. C. Cairns, Kigoma; R. D. Linton,
Tabora; B. J. Hartley, M.B.E., Arusha; F. R. Sanders, Coffee Research and
Experimental Station, Lyamungu, Moshi; J. Robertson, on duty at Johannes-
burg Exhibition; F. W. Thomas, on leave; R. B. Allnutt, on leave; J. R. Curry,
on leave; N. R. Fuggles-Couchman, on leave; G. W. Lock, Sisal Experimental
Station, Ngomeni, Tanga; D. Thornton, on leave; J. G. M. King, Shinyanga;
J. C. Eyre, Tanga; N. M. Wight, Ukiriguru, Mwanza; H. Gillman, Bukoba;
T. H. Marshall, Head Office, Morogoro; R. J. M. Swynnerton, Lushoto.

AGRICULTURAL OFFICERS (GINNERY): P. W. Briggs, on leave; N. Field, Morogoro.

SENIOR AGRICULTURAL ASSISTANTS: T. S. Jervis, Bukoba; C. J. M. Krige, Kilosa.

AGRICULTURAL ASSISTANTS: E. T. Ward, Iringa; R. W. Collett, Lindi; L. Leslie-
Moore, Bukoba; G. S. Brown, Mafia; B. E. Eustace, Tukuyu; A. Taylor,
Moshi; W. Sibley-Warne, Mpapura, Mikindani; A. Young, Musoma; W. C.
Clarke, Ukiriguru, Mwanza; L. F. Higgins, Moshi; R. Seager, Kahama;
A. A. E. Weirich, Same; B. R. D. Eccles, Shinyanga; H. L. Brett, on leave;
H. A. B. Fowler, Sisal Experimental Station, Ngomeni, Tanga; R. Silcock,
Morogoro; G. H. Foster, on leave; D. Shepstone, Tabora; J. H. McGregor,
Songea; D. F. O'Hara, Kwimba; C. B. Gibbins, Coffee Research and
Experimental Station, Lyamungu, Moshi.

SENIOR OVERSEER, AGRICULTURAL STATIONS: C. E. Allen, Shinyanga.

DISTRICT FOREMEN: N. W. E. McDermott, Maswa; O. H. Barratt, Utete;
A. A. F. Weir, Kilwa; E. Hockley, Shanwa, Maswa; E. Pienaar, Handeni.

CHIEF CLERK: D. F. T. Brown, Head Office, Morogoro.

EUROPEAN CLERKS: C. H. Taylor, Coffee Research and Experimental Station,
Lyamungu, Moshi; J. B. Hean, on leave; L. S. F. Berkeley, Head Office,
Morogoro.

PLANT AND SEED INTRODUCTIONS, 1936.

<i>Aleurites montana</i> ...	...	...	...	...	From Amani.
Bourbon coffee seed ...	...	...	...	...	„ U.S.A.
<i>Callicarpa rubella</i> ...	...	...	...	...	„ Amani.
Cotton strains (seed) ...	...	...	...	...	„ Sudan.
„ selection (jassid resistant strains) ...	...	...	...	...	„ Barberton.
„ U/4, 4.2 seed ...	...	...	...	...	„ Nyasaland.
„ seed (U/4 × Cambodia) × U/4 (77 crosses) ...	...	...	...	...	„ Barberton.
„ „ (U/4 × Gambia) × Cambodia (2 crosses) ...	...	...	...	...	„ „
„ „ 052 (half pound seed and 7 reselections) ...	...	...	...	...	„ „
<i>Cymbopogon martini</i> ...	...	...	...	...	„ Amani.
<i>Eucalyptus globulus</i> ...	...	...	...	...	„ South Africa.
Foster grapefruit (budwood) ...	...	...	...	...	„ Zanzibar.
Kudzu vine seed ...	...	...	...	...	„ Japan.
Kerr's Pink potatoes ...	...	...	...	...	„ Kenya.
<i>Lagerstroemia speciosa</i> ...	...	...	...	...	„ Amani.
Madagascar lima bean seed ...	...	...	...	...	„ Uganda.
Olive plants (five varieties) ...	...	...	...	...	„ South Africa.
Onion seed (red variety) ...	...	...	...	...	„ India.
<i>Petrea volubilis</i> (plants) ...	...	...	...	...	„ Zanzibar.
<i>Phaseolus lunatus forma macrocarpus</i> ...	...	...	...	...	„ Nigeria.
Pyrethrum seed ...	...	...	...	...	„ Kenya.
Rice strains (seed) ...	...	...	...	...	„ Malaya.
Rye seed (six varieties) ...	...	...	...	...	„ India.
Soya bean seed (two varieties) ...	...	...	...	...	„ Java.
Tara beans ...	...	...	...	...	„ England.
Tobacco seed (four varieties) ...	...	...	...	...	„ South Africa.
<i>Thunbergia grandiflora</i> ...	...	...	...	...	„ Amani.
<i>Widdringtona whytei</i> ...	...	...	...	...	„ „

LIST OF GINNERIES EXISTING IN 1936.

Province and District	Locality	Last licensed	Number of Gins		Licensee
			Saw	Roller	
<i>Eastern :</i>					
Dar es Salaam	Ruvu ...	1936/37	1	26	Vithaldas Haridas & Co., Ltd.
"	Pugu ...	"	—	18	Abdulrasul and Sons
Morogoro ...	Morogoro ...	"	—	22	Tanganyika Cotton Co., Ltd.
"	Mikesse ...	"	—	21	East African Cotton Co., Ltd.
"	Ngerengere ...	"	—	16	Liverpool-Uganda Co., Ltd.
"	Mlali ...	1930/31	—	18	Tanganyika Cotton Co., Ltd.
"	Duthumi ...	1936/37	—	18	" " "
"	Mkata ...	1930/31	—	12	" " "
"	Turiani ...	1936/37	—	16	" " "
Kilosa	Kilosa ...	1936/37	—	18	Juma Haji
"	*Berabera ...	"	—	12	Kimamba Planters' Ginning Co., Ltd.
"	Rudewa ...	"	—	25	Tanganyika Cotton Co., Ltd.
"	Msowero ...	"	—	14	Kladitis and Samaris
Bagamoyo	Mandera ...	"	—	16	Liverpool-Uganda Co., Ltd.
"	†Kisauke ...	1928/29	—	2	S. G. Drosopoulos
Rufiji	Kilimani ...	1936/37	—	12	Kilimani Plantations
"	Msomeni ...	"	—	8	Liverpool-Uganda Co., Ltd.
"	Logeloge ...	"	—	8	East African Cotton Co., Ltd.
Ulanga	Kiberege ...	"	—	12	Vithaldas Haridas & Co., Ltd.
<i>Lindi :</i>					
Lindi	Mtua ...	1936/37	—	14	Mathuradas Kalidas and Co.
Kilwa	Kikanda ...	"	—	10	Kikanda Cotton Trading Co., Ltd.
Mikindani	Mikindani ...	1936/37	—	5	Mathuradas Kalidas and Co.
<i>Tanga :</i>					
Handeni	Sinden ...	1936/37	2	2	Moshi Trading Co. Ltd.
Korogwe	Korogwe ...	"	—	24	" "
<i>Northern :</i>					
Moshi	Moshi ...	"	—	24	" "
Mbulu	Idulu ...	"	—	8	M. Michaelakis
<i>Lake :</i>					
Shinyanga	Usogore ...	"	—	12	Bhagwanji Sunderji & Co.
"	Luhombo ...	"	4	—	" " "
Mwanza	Mwanza ...	"	—	20	Nakasero Trading Co. "
"	Murutunguru ...	"	1	24	White Fathers' Mission
"	Ihale ...	"	—	14	Mwanza Cotton Trading Co., Ltd.
"	Bukumbi ...	"	—	12	Bhagwanji Sunderji & Co.
"	Nassa ...	"	—	20	Narandas Rajaram & Co.(Africa), Ltd.
Kwimba	Nyambiti ...	"	—	16	Lake Province Cotton Co., Ltd.
"	Pambani ...	"	—	17	Kampala General Agency
Maswa	Malampaka ...	"	—	13	Bhagwanji Sunderji & Co.
Musoma	Mugango ...	"	—	20	Lake Province Cotton Co., Ltd.

*Non-Native cotton only.

†Private ginnery.

